CINEC CAMPUS
Beyond A Graduate

PAST PAPERS

Faculty	Department / Section/Division
Not Applicable	Learning Resource Centre

Past Papers

Faculty of Humanities & social Sciences
Department of Logistics & Transportation

Bsc.in International Transportation Management and Logistics Transportation (Year 3 – Semester II)

2016-2022

CINEC CAMPUS
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Faculty of Management and Social Sciences
Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

Year 3 Semester II

SEMESTER END EXAMINATION

Customs and Commodity Inspections Operations – CCIO0234

- This paper consists of EIGHT questions on FOUR (04) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
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- Write Legibly.
- Required documents are attached.

Date: 2020.09.27 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Nikko Best (Pvt) Ltd has imported 01 unit of used Toyota Aqua hybrid car (model NHP10) fitted with a 1,490 cc hybrid engine from Japan. The price agreed was JPY 1,400,000 Ex Works. In addition to that Nikko Best (Pvt) Ltd has paid JPY 35,000 as local handling charges to a handling company in Japan. However according to the list of minimum values published by the Sri Lanka Customs the minimum FOB price of Toyota Aqua NHP10 is JPY 1,895,000.

Ms. NYK Line Lanka (Pvt) Ltd has endorsed on the copy of the Bill of Lading that their standard freight cost is USD 65 per CBM. The volume of a Toyota Aqua car is 14.55 CBM.

The marine insurance has been obtained locally from the Sri Lanka Insurance Corporation for Rs. 7,250/=.

According to the Sri Lanka Tariff Guide 2016 the hybrid motor cars having a spark-ignition internal combustion reciprocating piston engine with a capacity less than 1500cc are classified within HS Code 8703.22.51 and the following taxes are payable to Sri Lanka Customs at the time of clearance.

(A) Customs Duty	- 25%
(B) VAT	- 11%
(C) PAL	- 5%
(D) NBT	- 2%
(E) Excise (SP) Duty	- 92% or Rs. 1,750/= per cubic centimetre of engine.

Exchange Rates are Rs. 145.8899 per US Dollar and Rs. 1.2416 per Japanese Yen.

Calculate all five taxes payable for the subject vehicle. Formulas are provided in the attached document to this question paper.

(20 Marks)

Question 02

Grand International Group is a multinational company based in the USA and the rights holder of several world renowned brands including "Walker" and "Bee" brands.

Great Walker Ltd is a Shoe manufacturing company based in China. They manufacture "Walker" brand Shoes according to the specified quality of Grand International Group and supply the same only to the buyers nominated by Grand International Group. Grand International Group holds 63% of shares of Great Walker Ltd and several Directors of Great Walker Ltd are also Directors of Grand International Group.

Grand Lanka Ltd is a Sri Lankan trading company registered under the Companies Act. However, Grand International Group holds 98% of shares of Grand Lanka Ltd. Several Directors including the Managing Director of Grand Lanka Ltd are also Directors of Grand International Group. Grand Lanka Ltd has been appointed by Grand International as their Sole-Agent in Sri Lanka for the sale of "Walker" brand Shoes. In addition to the Sole-Agency Agreement Grand Lanka Ltd has also entered into an agreement with Grand International Group termed as Royalty Agreement. According to this Royalty Agreement, Grand Lanka has to pay 5% of the Ex-Work price as Royalty to Grand International Group for the "Walker" brand Shoes purchased from Great Walker Ltd.

Grand Lanka has imported a shipment of 01x20' container said to contain 5,000 pairs of "Walker" brand Shoes from Great Walker Ltd. The Ex-Work price agreed is USD 2.50 per pair of Shoes. Grand Lanka has entrusted the transportation of the said

container from China to the Port of Colombo to a Freight Forwarding company namely Sea-Sky Lanka Ltd. They have issued a quotation containing the following charges.

Charges at Origin

Sea Freight	- USD 1285
Packing Cost	- USD 315
Inland Transport	- USD 725
Handling Charges	- USD 165

Charges at Destination

Terminal Handling (THC)	- USD 250
Container Deposit	- Rs. 5750
Container Washing	- Rs. 1150

In addition to the above charges the Sea-Sky Lanka Ltd has also charged USD 150 as Bunker Adjustment Fee (BAF) and USD 110 as Currency Adjustment Fee (CAF) on the arrival of the container. The marine insurance has been obtained locally from Sri Lanka Insurance Company on payment of Rs. 16,875/= for the whole shipment. The Exchange Rate is Rs. 135.00 per US Dollar.

(a) Calculate the **Cost of Transport** of the subject shipment from the warehouse of Great Walker Ltd to the Port of Colombo in **USD** (06 Marks)

(b) Calculate the amount of **Royalty** payable to Grand International Group by Grand Lanka Ltd against the subject shipment in **USD** (06 Marks)

(c) Calculate the **Customs Value** of the subject shipment in **Sri Lankan Rupees** (08 Marks)

Question 03

Write an essay describing the structure, functions, objectives and the legal framework of the Sri Lanka Customs (20 Marks)

Question 04

(a) Name the **6 methods** given in the WTO Valuation Agreement to determine the Customs (10 Marks)

(b) Explain the **method 1** and the adjustments to be made to the value so determined (10 Marks)

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Question 05

(A) Name the documents required to clear the imported goods through Customs.

(B) Explain in details the steps you should follow in clearing imported goods through Customs.

(20 Marks)

Question 06

Explain in detail the 6 General Rules for the interpretation of Harmonized System (GRI) with suitable examples.

(20 Marks)

Question 07

Imagine that you start a trading company and decide to introduce a new smart phone model to the market. Explain in details the steps you should follow in finding a supplier, negotiating with the supplier and clearing imported goods through Customs. (20 Marks)

Question 08

Select 04 topics from the following topics and write 04 short essays

(A) Customs Ordinance
(B) Imports and Exports (Control) Act
(C) Methods of payment in international trade
(D) Bill of Lading/ Airway Bill
(E) Non-Tariff Barriers
(F) General Agreement on Tariff and Trade (GATT)
(G) Section 10 of the Customs Ordinance of Sri Lanka

(20 Marks)

----------END OF THE QUESTION PAPER----------

Computation formulae for imported goods

Where

v	=	CIF value in Rupee
c	=	Cess levy under Sri Lanka Export Development Act
d	=	Customs Duty
e	=	Excise (Special Provisions) Duty (ED)
t	=	Value Added Tax (VAT)
n	=	Nation Building Tax
p	=	Port and Airport Development Levy (PAL)
r_e	=	Rate of Excise (Special Provisions) Duty (ED)
r_t	=	Rate of Value Added Tax (VAT)
r_n	=	Rate of Nation Building Tax

- Customs Duty (d) = (CIF value) × (Customs duty rate)
  or
  = (quantity) × (unit rate of customs duty)

- Value Added Tax (t) = (v + 10% of v + d + c + p + e) × r_t

- Cess Levy (c) = (v + 10% of v) × (Cess levy rate)
  or
  = (quantity) × (unit rate of Cess levy)

- Port and Airport Development Levy (p) = (CIF value) × (PAL rate)

- Excise (Special Provisions) Duty (e) = (v + 15% of v+ d + c + p) × r_e
  or
  = (quantity) × (unit rate of Excise Duty)

- Special Commodity Levy = (Quantity) × (unit rate of Special Commodity Levy)

- Nation Building Tax (n) = (v +10%v + d + c + p + e) r_n

Schedule

Rates of Exchange Effective From 26.08.2019 to 01.09.2019

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4	Brazil	BR	Brazil Real	BRL	44.5388
5	Brunei	BN	Brunei Dollar	BND	130.7519
6	Canada	CA	Canadian Dollar	CAD	136.1082
7	China	CN	Renminbi	CNY	25.5432
8	China	CN	Offshore	CNH	25.5238
9	Czechoslovakia	CZ	Koruna	CZK	7.7845
10	Denmark	DK	Kroner	DKK	26.9204
11	Egypt	EG	Pound	EGP	10.9379
12	Euro Zone		Euro	EUR	200.7161
13	Ghana	GH	Cedi	GHS	33.2554
14	Hongkong	HK	Dollar	HKD	23.1213
15	Hungary	HU	Forint	HUF	0.6116
16	India	IN	Rupee	INR	2.5197
17	Indonesia	ID	Rupiah	IDR	0.0127
18	Iran	IR	Riyal	IRR	0.0043
19	Japan	JP	Yen	JPY	1.7013
20	Jordan	JO	Dinar	JOD	255.6300
21	Korea	KR	Won	KRW	0.1492
22	Kuwait	KW	Dinar	KWD	595.8958
23	Macau	MO	Pataca	MOP	22.4448
24	Malaysia	MY	Ringgit	MYR	43.2609
25	Maldives	MV	Rufiya	MVR	11.7233
26	Mauritius	MU	Rupee	MUR	5.0067
27	Myanmar	MM	Kyat	MMK	0.1192
28	Nepal	NP	Rupee	NPR	1.5773
29	New Zealand	NZ	Dollar	NZD	115.8316
30	Nigeria	NG	Naira	NGN	0.5914
31	Norway	NO	Kroner	NOK	20.1745
32	Oman	OM	Riyal	OMR	470.7515
33	Pakistan	PK	Rupee	PKR	1.1363
34	Papua New Guinea	PG	Kina	PGK	53.3757
35	Philippines	PH	Peso	PHP	3.4601
36	Poland	PL	Zloty	PLN	46.0407
37	Qatar	QA	Riyal	QAR	49.7780
38	Russia	RU	Rouble	RUB	2.7635
39	Saudi Arabia	SA	Riyal	SAR	48.3266
40	Seychelles	SC	Rupee	SCR	13.2584
41	Singapore	SG	Dollar	SGD	130.7519
42	South Africa	ZA	Rand	ZAR	11.8970
43	Sweden	SE	Krona	SEK	18.7291
44	Switzerland	CH	Francs	CHF	184.1045
45	Taiwan	TW	Dollar	TWD	5.7701
46	Thailand	TH	Baht	THB	5.8854
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49	United States of America	US	Dollar	USD	181.2417
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52	Zimbabwe	ZW	Dollar	ZWD	0.4776

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12	Euro Zone		Euro	EUR	200.7161
13	Ghana	GH	Cedi	GHS	33.2554
14	Hongkong	HK	Dollar	HKD	23.1213
15	Hungary	HU	Forint	HUF	0.6116
16	India	IN	Rupee	INR	2.5197
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33	Pakistan	PK	Rupee	PKR	1.1363
34	Papua New Guinea	PG	Kina	PGK	53.3757
35	Philippines	PH	Peso	PHP	3.4601
36	Poland	PL	Zloty	PLN	46.0407
37	Qatar	QA	Riyal	QAR	49.7780
38	Russia	RU	Rouble	RUB	2.7635
39	Saudi Arabia	SA	Riyal	SAR	48.3266
40	Seychelles	SC	Rupee	SCR	13.2584
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Year 3 Semester II

SEMETSER END EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT questions on FIFTEEN (15) pages.
- Answer FIVE Questions including Question 01.
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Date: 2020.09.25 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Answer the MCQ questions given below. Write the correct answer on the answer book (20 Marks)

1. Operations Research approach is ……,
   A. Multi-disciplinary
   B. Scientific
   C. Intuitive
   D. Collect essential data

2. A feasible solution to a linear programming problem ……..
   A. Must satisfy all the constraints of the problem simultaneosly
   B. Need not to satosfy all the constraints but only some of them
   C. Must be a corner point of the feasible region
   D. Must optimize the value of the objective function

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3. An optimal solution to a linear programming problem .....
   A. Must satisfy all the constraints of the problem simultaneosly
   B. Must be a corner point of the feasible region
   C. Must optimize the value of the objective function
   D. All of the above.

Consider the LP problem given below. Question 4,5 and 6 based on this LP problem

Min Z = 5 X1 + 7 X2

Subject to constraints

2X1 + 3 X2 >= 42

X1 + X2 >= 18

X1, X2 >= 0

4. What is the dual objective function of the above primal problem?
   A. Min Z = 42Y1 + 18 Y2
   B. Max Z = 7Y1 + 5 Y2
   C. Max Z = 42 Y1 + 18 Y2
   D. Min Z = 42 Y1 - 18 Y2

5. Consider the statements given below.
   a. There exit two decision variables in the dual problem
   b. One constraint can be written as 2Y1 + Y2 >= 5
   c. Primal problem can be solved using Dual Simplex algorithm

   What is the correct statement/s?
   A. a. only
   B. a. and b. only
   C. a. and c. only

D. all of the above

6. Constaints of the dual problem are,
   A. 2Y1 + Y2 <=5 and 3Y1 + Y2 >= 7
   B. 2Y1 + Y2 <=5 and 3Y1 + Y2 <= 7
   C. 2Y1 + Y2 >=5 and 3Y1 + Y2 <= 7
   D. 2Y1 + Y2 >=5 and 3Y1 + Y2 >= 7

Table given below is an initial table of a Linear programming problem with maximization objective function and Two-phase method is used to solve the LP Problem. Question 7 and 8 are based on the below table.

BASIC	X1	X2	X3	S1	S2	R1	VALUE	RATIO
S1	2	1	1	1	0	0	2	
R1	3	3	2	0	-1	1	8	
Z	-2	-2	-4	0	0	0	0	
F	3	4	2	0	-1	0	8	

7. What is the entering variable of the above table according to Two-phase method.
   A. S1
   B. X1
   C. X2
   D. X3

8. What is the leaving variable of the above table according to Two-phase method?
   A. X1
   B. X2
   C. S1
   D. R1

9. The purpose of the method of Multipliers is to
   A. assist one in moving from an initial feasible solution to the optimal solution.
   B. determine whether a given solution is feasible or not
   C. identify the relevant costs in a transportation problem.
   D. develop the initial solution to the transportation problem.

10. An initial transportation solution appears in the table given below.

	C	D	Factory Capacity
A	10	0	10
B	15	25	40
Warehouse Demand	25	25	50

Can this solution be improved if it costs $5 per unit to ship from A to C; $7 per unit to ship from A to D; $8 to ship from B to C; and $9 to ship from B to D?

A. Yes, the initial solution can be improved by $10.
B. No, this solution is optimal.

C. Yes, this solution can be improved by $50.

D. Yes, this solution can be improved by $100.

11. What is the cost of the transportation solution shown in the table?

	W	X	Y	Supply
A	$3 20	$5 50	$9 0	70
B	$5 0	$4 30	$7 0	30
C	$10 40	$8 0	$3 80	120
Demand	60	80	80	220

A. $1350

B. $1070

C. $1230

D. $1150

12. In order for a linear programming problem to have a unique solution, the solution must exist .....

A. at the intersection of the nonnegativity constraints.

B. at the intersection of two or more constraints.

C. at the intersection of a nonnegativity constraint and a resource constraint.

D. at the intersection of the objective function and a constraint.

13. Unboundedness is usually a sign that the LP problem

A. has finite multiple solutions
B. is degenerate.
C. contains too many redundant constraints.
D. has been formulated improperly.

14. The transportation method assumes that .....

A. there are no economies of scale if large quantities are shipped from one source to one destination.
B. the number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns in the table plus 1
C. there is only one optimal solution for each problem.
D. the number of dummy sources equals the number of dummy destinations.

15. if the feasible region of a LP model is empty, the solution is,

A. infeasible
B. unbounded
C. alternative
D. degeneracy

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Question 16 to 20 are based on following LP problem

Min Z = 10 X1 + 5X2

Subject to

3X1 + 2X2 >= 10

X1 + 3X2 >= 5

X1, X2 >= 0

16. If this LP problem is to solved using Two phase method, what is the Artificial Function of the problem?
    A. F = 4X1 + 5X2 -S1 -S2 +15
    B. F = -4X1 – 5X2 + S1 + S2 +15
    C. F = 4X1 – 5X2 + S1 + S2 +15
    D. F = -4X1 – 5X2 + S1 + S2 -15

17. What is the dual objective function of this primal problem?
    A. Max Z = 10 X1 + 5 X2
    B. Min Z = 10 X1 + 5 X2
    C. Max Z = 10 Y1 + 5 Y2
    D. Max Z = 10 X1 - 5 X2

18. Which method can be used to solve the dual problem of the above primal problem?
    A. Simplex method
    B. Dual Simplex method
    C. Two-phase Method
    D. All of the above

Table given below is the optimal tableau of the primal problem given above.

BASIC	X1	X2	S1	S2	VALUE
X2	3/2	1	-1/2	0	5
S2	7/2	0	-3/2	1	10
Z	-5/2	0	-5/2	0	25

19. Using above table, derive the values of the Y1 and Y2 in the dual problem.
    A. Y1 = -2.5, Y2 = 0
    B. Y1 = 2.5, Y2 = 0
    C. Y1 = 5, Y2 = 10
    D. Y1 = -2.5, Y2 = 10

20. What is the optimal value of the dual objetive function
    A. W = 5
    B. W = 10
    C. W = 2.5
    D. W = 25

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Question 02

A firm manufactures three products A, B and C. it uses two types of raw materials I and II of which 5,000 and 7,500 units respectively available. The raw material requirements per unit of the products are given below.

Raw Material	Requirement per unit of product		
	A	B	C
I	3	4	5
II	5	3	5

The labour time for each unit of product A is twice as that of Product B and three times that of product C. the entire labour force of the firm can produce is 3,000 units. The minimum demand for the three produts is 600, 650 and 500 units respectively for A, B and C. Also the ratio of the number of units produced must be equal to 2:3: 4. Assuming the profits per unit of A, B and C are 50, 50 and 80 respectively.

Formulate this problem as a linear programming problem in order to determine the number of units of each product to be produced in order to maximize the profit.

(20 Marks)

Question 03

Use graphical method to solve the following LP model. (20 Marks)

Max Z = 7X1 + 3X2

Subject to

$X1 + 2X2 \geq 3$

$X1 + X2 \leq 4$

$X1 \leq 3$

$X2 \leq 2$

$X1, X2 \geq 0$

Question 04

Solve below LP model using Simplex method. (20 Marks)

Max Z = 4X1 + 3X2

Subject to constraints

2X1 + X2 <= 1000

X1 + X2 <= 800

X1 <= 400

X2 <= 700

X1, X2 >=0

Question 05

Solve below LP Model using Two Phase Method. Clearly mention the Phase I Objective function. (20 Marks)

Min Z = 5 X1 + 7 X2

Subject to constraints

2X1 + 3 X2 >= 42

X1 + X2 >= 18

X1, X2 >= 0

Question 06

Consider the LP model given below

Minimize Z = 6X1 + 4X2

Subject to constraints

4X1 + X2 >= 2

3X1 + 2X2 >=3

X1 + 5X2 >= 1

X1,X2 >= 0.

(a) Find the dual problem of this primal problem (05 Marks)
(b) Solve the primal problem using dual simplex method. (10 Marks)
(c) Derive the solution of the dual problem using the optimal table of the primal problem. (05 Marks)

Question 07

Mr. Silva is the Managing Director of Sewana Cement Manufacturing company is concerned with the problem of distributing the cement from three factories to four distribution centers. The supplies of Cement in each factory is as follows.

Table 7.01

Factory Name	Supply Tonnes per week
Factory 1	20,000
Factory 2	38,000
Factory 3	16,000

The demand at four distribution centres are as follows

Table 7.02

Distribution Centre	Demand Tonnes per week
A	10,000
B	18,000
C	22,000
D	24,000

The transportation cost is USD 0.5 per tonne per kilometre. The distance between the Factories and the distribution centers is as given below.

Table 7.03

	A	B	C	D
Factory 1	50	60	100	50
Factory 2	80	40	70	80
Factory 3	90	70	30	50

(a) Find the initial solution using North West Corner Method (05 Marks)
(b) Find the Optimal Solution using method of multipliers. (15 Marks)

Question 08

LMS is software solutions that manage administration, monitoring, and reporting of online courses and training programs within an organization. It serves as a **virtual classroom** where teachers can interact with their students and conduct learning activities online.

CINEC LMS had one system administrator and students contact the system administrator to assist their LMS related problems.

Time between students' requests and service time of the system administrator is shown in below tables.

Table 8.1: distribution of time between arrivals (students' requests)

Time between arrivals (in minutes)	Probability
1	0.25
2	0.40
3	0.20
4	0.15

Table 8.2: distribution of service time of System Administrator

Service time (in minutes)	Probability
2	0.30
3	0.28
4	0.25
5	0.17

During the lockdown period of COVID-19 pandemic in Sri Lanka, CINEC decided to recruit assistant system administrator as one person cannot assist all students' request as LMS was the only one option for staff and students to continue their academic work. Efficiency of the assistant system administrator is not as good as the system administrator, so system administrator is preferred when both of them are available.

Service time of the assistant system administrator is given below.

Table 8.3: distribution of service time of B

Service time (in minutes)	Probability
3	0.35
4	0.25
5	0.20
6	0.20

Consider the following random numbers and simulate the above and discuss the followings;

1. Distribution of each student delay to get the service and the average waiting time of students
2. Probability of waiting time
3. Probability of waiting time for both A and B

Random numbers for arrivals (Students' requests):

89, 24, 56, 60, 34, 92, 45, 40, 8, 73, 15

Random numbers for service time of system administrator:

88, 63, 23, 94, 74, 17, 11, 41

Random numbers for service time of assistant system administrator:

42, 53, 93, 24, 51, 16, 41

(20 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMETSER END EXAMINATION

Project Management – PMGT0364

- This paper consists of EIGHT questions on FIVE (05) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2020.09.21 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) List four unique characteristics of projects. (04 Marks)

(b) Identify three essential skills any project manager should have and explain how those are important in conducting projects. (06 Marks)

(c) Explain what project management knowledge areas are and list five project management knowledge areas. (06 Marks)

(d) Explain how proper management of scope could benefit projects. (04 Marks)

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Question 02

(a) Project Alpha requires an initial investment of $300,000 and is expected to generate the following net cash inflows:

Table 1.00: Project Alpha, cash inflows

Year	Net cash inflow ($)
Year 1	60,000
Year 2	70,000
Year 3	90,000
Year 4	55,000
Year 5	50,000

i. Calculate the payback period for project Alpha. (02 Marks)

ii. Calculate the Net Cash Flow for project Alpha considering that discount rate applicable for this project is 10%. (04 Marks)

iii. With the payback and NPV calculated, explain how you would take a decision on project Alpha, considering what other factors? (04 Marks)

(b) Briefly explain the stages of project life cycle with the activities conducted in each stage. (10 Marks)

Question 03

(a) Mention a suitable example and explain how other factors could be managed when time is constrained in a project with related to project priorities. (05 Marks)

(b) Explain the concept of "Responsibility matrix" and when it is appropriate to use this tool. (05 Marks)

(c) Describe the steps of developing a project communication plan. (10 Marks)

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Question 04

(a) List eight items that are typically included in a project charter. (04 Marks)

(b) Explain how projects come about and the connection between organization strategy and projects. (06 Marks)

(c) Briefly explain why projects need to be selected and prioritized. (05 Marks)

(d) Briefly explain three essential steps of project stakeholder analysis. (05 Marks)

Question 05

(a) Explain why deadlines of some projects need to be advanced. (06 Marks)

(b) List five types of project closures and explain any three. (08 Marks)

(c) Explain the purpose of carrying out post implementation evaluations and explain the barriers that are there for retrospectives. (06 Marks)

Question 06

A project is specified by activities A, B, C, D, E, F and G. Following table 2.00 represents the nature of the relationships and relevant lags among these activities.

Table 2.00: Activity relationships.

Activity	Activity Duration	Relationship	Lag
A	5	-	-
B	3	Finish to Start A to B	-
C	3	Start to Start A to C	5
D	2	Finish to Start C to D	2
		Finish to Finish B to D	5
E	12	Start to Start D to E	3
F	5	Finish to start D to F	2
		Finish to Finish E to F	5
G	2	Finish to Start F to G	-

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(a) Draw the network diagram to represent the project. (04 Marks)

(b) Calculate the Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF) and Slack (SL using EF & ES) for activities A, B, C, D, E and F. (10 Marks)

(c) Identify the activities in the critical path. (02 Marks)

(d) What are the advantages of constructing project network? (04 Marks)

Question 07

(a) What are the two types of contingency funding? (02 Marks)

(b) Explain the "Risks" in the context of projects. (04 Marks)

(c) Briefly explain the "Risk breakdown structure" method of risk identification. (04 Marks)

(d) Name four main risk response strategies and explain two strategies with examples. (10 Marks)

Question 08

(a) Explain the use of estimates for projects. (06 Marks)

(b) Explain the difference between Top-down and Bottom-up estimating. (05 Marks)

(c) With suitable examples, explain three reasons to adjust the estimates of projects. (09 Marks)

----------END OF THE QUESTION PAPER----------

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1. **Payback**

A = Last year with a negative cumulative cash flow, B = Remaining value of negative cumulative cash flow at the end of the period A, C = Cash inflow during the period following period A.

$$\text{Payback} = A + \frac{B}{C}$$

2. **Present Value**

When i=*Discount rate* and n=*Year numbe.*

$$Present\ Value = \frac{Cash\ flow}{(1+i)^n}$$

3. Present Value table

Present value of \$1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

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Year 3 Semester II

SEMETSER END EXAMINATION

Airport Planning and Management – APMG0353

- This paper consists of EIGHT questions on FOUR (04) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2020.09.18 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) Provide short descriptions on below two International Organizations. (05 Marks)

i. International Civil Aviation Organization (ICAO)

ii. International Air Transport Association (IATA)

(b) "Hub and Spoke model is more suitable for SriLankan Airline" Validate the above argument by providing **characteristics/advantages** of Hub & Spoke Model. Furthermore state two different type of Hub & spoke models available in modern aviation. (05 Marks)

(c) How do airports contribute to the economic prosperity of the communities that they serve? (10 Marks)

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Question 02

(a) What is meant by "Airport Privatization" and briefly describe Goble Trends in Airports Privatization? (05 Marks)

(b) "Airport Manager" is one of the most important Job position in any Airport. Provide at least five responsibilities of Airport Manager? (05 Marks)

(c) Provide short description on "Unit Terminal Concept" & mention three configurations types of Unit Terminals. (05 Marks)

(d) "Different types of **Terminal Layouts** are available in modern Airports". State three types of Terminal Layouts and briefly describe two of them. (05 Marks)

Question 03

(a) "A good Accounting system" is essential for Airports to maintain healthy financial status. Mention atleast **three** other benefits of having good accounting system in an Airport? (03 Marks)

(b) List down at least **three** important Processes in Airport Terminal & provide brief description on **two** Processes? (05 Marks)

(c) "Usually Airports are earning Operating Revenue from five Areas (Major Revenue Groups)". Briefly explain two of them. (05 Marks)

(d) "Allocating the expenses for Airport liability Insurance is an acceptable strategy in Airport Financial Management".
Validate the above statement by providing brief introduction to **Airport Liability Coverage.** (07 Marks)

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Question 04

(a) Briefly explain why "**WLU - Work Load Unit**" is not a satisfactory measurement for Airports? (03 Marks)

(b) What is a "**NOTAM**"? Explain the term by providing Reasons for issuing NOTAMs? (05 Marks)

(c) Define the Term "Delay" in Aviation context & mention **at least four reasons** for Flight Delays. (05 Marks)

(d) State at least **three** factors affecting Airport Capacity? Provide a short description on two of the above mentioned factors. (07 Marks)

Question 05

(a) What are the four components that make up an airport? (04 Marks)

(b) There are 3 different types of runways based on the markings that exist. These markings are decided based on the navigational aids that are available in the airport. Explain these different types of runways based on the markings with graphical illustrations (16 Marks)

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Question 06

(a) What are the main objectives of Air traffic Services ? (05 Marks)

(b) What is meant by FIR? List down FIRs that are adjoining to the Colombo FIR (06 Marks)

(c) What are the roles of BIA Control Tower, BIA Approach Rader control center, Ratmalana Area control center in air traffic controlling? (09 Marks)

Question 07

(a) What are the possible security threats in air transport industry? (04 Marks)

(b) Name 4 methods of security control at commercial airports. Explain two of these methods in detail (08 Marks)

(c) Explain how pilots make use of PAPIs and VASIs when approaching to land in an airport. You may use graphical illustrations to support your answer. (08 Marks)

Question 08

(a) "US Aviation industry is playing a critical & commanding role in World Aviation." Briefly explain the statement by providing examples. (05 Marks)

(b) Explain the "Airline Deregulation" concept in commercial aviation by providing at least two effects of Deregulation Practice. (05 Marks)

(c) Explain four components of airport master planning in brief. (10 Marks)

----------*END OF THE QUESTION PAPER*----------

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Year 3 Semester II
SEMETSER END EXAMINATION
Econometrics – ECON0321

- This paper consists of EIGHT questions on EIGHT (08) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.
- Statistical tables and formulae sheets will be given

Date: 2020.09.16 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Select the correct answer and write that number in your answer script.

(a) Sample statistics that is used to estimate a parameter is called

i. Estimator ii. Estimate iii. Confidence

iv. Parameter

(b) The standard deviation of a Sample distribution is called.

i. Population standard deviation ii. Estimator

iii. Standard error iv. Parameter

(c) Which one is said by Central Limit Theorem?

i. Population mean is equal to the sample mean.

ii. Mean of the sample means is equal to the population mean

iii. Sample mean is equal to the population mean

iv. None of the above

(d) The numbers of values that are free to vary after restrictions have been placed on data.

i. Estimate ii. Estimator iii. Degree of freedom iv. Statistic

(e) The calculate value to the sample is called

i. Degrees of freedom ii. Parameter iii. Sample estimate

iv. Statistics

(f) If a hypothesis consists of single value that is called

i. Alternative hypothesis ii. Null hypothesis

iii. Simple hypothesis iv. Composite hypothesis

(g) Population parameter will be within a region according to some probability, this is called.

i. Significant levels ii. Critical points iii. Confidence coefficient

iv. Estimators

(h) Average weight and standard deviation of a sample size of 100 are respectively 50kg and 3.5kg. What is the standard error?

i. 0.35 ii. 0.035 iii. 2.85 iv. 5

(i) Management of a company says that no difference in weight between three products. Which technique is appropriate to test this statement?

i. Independent sample t test ii. Paired sample t test

iii. One sample t test iv. One way ANOVA

(j) Coefficient of determination in the regression model is 0.81. Size of the sample is 10. What is the coefficient of multiple correlation.

i. 0.54 ii. 0.9 iii. 0..65 iv. 0.61

(02×10 = 20 Marks)

Question 02

(a) Briefly describe econometrics and financial econometrics.

(10 Marks)

(b) Describe the traditional econometric methodology with an example

(10 Marks)

Question 03

(a) Describe six assumptions of Classical Linear Regression Model (CLRM)?

(12 Marks)

(b) Why we test stationary of data in time series models?

(08 Marks)

Question 04

(a) Management of a manufacturing company says that average weight of their product is 30kg. Selecting 12 items, weight has been estimated and information is provided by the following table.

30.2	29.5	29.1	30.3	29.2	30.4	28.7	29.1	30.1	29.2	30.3	29.2

(i) Test the statement of the management.

(06 Marks)

(ii) Estimate the confidence interval of the difference.

(02 Marks)

(b) Management of two companies say that there is no difference in weight between the two types of brands. Following table provides information about the weight of 10 items from each brand.

Brand 1	29.0	29.3	29.1	28.9	28.8	29.3	28.7	28.9	28.9	29.0
Brand 2	29.4	28.5	28.9	29.1	28.7	28.9	29.0	29.7	29.1	28.6

(12 Marks)

Question 05

(a) What is the importance of one way Analysis of Variance (ANOVA)

(05 Marks)

(b) Three products have been grouped as category "A", category "B" and category "C" according to the demand. Selecting five items from each category, quality has been tested and marks have been given to each item out of 15. Result is provided by the following table. Construct one way ANOVA and test whether there is a difference in the quality between at least two categories.

Category "A"	Category "B"	Category "C"
12	09	07
14	11	10
10	07	06
09	12	09
15	11	08

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(15 Marks)

Question 06

Following data are provided for six years of exports income and foreign reserves in developing company.

Exports.(Rs. Billion)	Reserves (Rs. Mn)
3	20
4	30
5	30
5	50
6	60
7	50

(a) Interpret the relationship between export income and foreign reserves.

(06 Marks)

(b) Construct linear regression model for the data.

(06 Marks)

(c) Construct Regression ANOVA table and interpret the results.

(06 Marks)

(d) Calculate R square and interpret the results.

(02 Marks)

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Question 07

(a) Write Augmented Dickey Fuller (ADF) unit root test to examine random walk with drift and trend for Exchange Rate (ER).

(06 Marks)

(b) What are the critics in VAR models?

(06 Marks)

(c) Interpret the following Augmented Dickey Fuller unit root test results.

Variables	Probability at level	Probability at first difference
Exchange Rate (ER)	0.3122	0.004
Exports (EX)	0.6537	0.000
Imports (IM)	0.8812	0.000

(03 Marks)

(d) Selecting two period lag length and two co-integration equations, Vector Auto Regressive Model (VECM) has been constructed below. Interpret the VECM results.

Dependent Variable: D(ER)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.090185	0.014951	-6.032030	0.0000
C(2)	0.106123	0.104176	1.018694	0.3185
C(3)	0.271966	0.213519	1.273736	0.2150
C(4)	-0.053465	0.207416	-0.257765	0.7988
C(5)	0.085367	0.167986	0.508183	0.6160

C(6)	0.007186	0.161709	0.044440	0.9649
C(7)	0.081490	0.136036	0.599035	0.5548
C(8)	-0.089414	0.144066	-0.620646	0.5407
C(9)	0.096953	0.060768	1.595454	0.1237

		Mean dependent	
R-squared	0.215519	var	0.140459
Adjusted R-squared	-0.045975	S.D. dependent var	0.051826
		Akaike info	
S.E. of regression	0.053004	criterion	-2.809908
Sum squared resid	0.067426	Schwarz criterion	-2.401769
		Hannan-Quinn	
Log likelihood	55.36348	criter.	-2.672582
F-statistic	0.824185	Durbin-Watson stat	1.837371
Prob(F-statistic)	0.589577		

(05 Marks)

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Question 08

Write short notes on followings.

(a) Random walk of data

(b) Homoscedasticity

(c) Normality of residuals

(d) Serial correlation

(e) Cointegration

(20 Marks)

----------END OF THE QUESTION PAPER----------

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
51	4.030	3.179	2.786	2.553	2.397	2.283	2.195	2.126	2.069	2.022
52	4.027	3.175	2.783	2.550	2.393	2.279	2.192	2.122	2.066	2.018
53	4.023	3.172	2.779	2.546	2.389	2.275	2.188	2.119	2.062	2.015
54	4.020	3.168	2.776	2.543	2.386	2.272	2.185	2.115	2.059	2.011
55	4.016	3.165	2.773	2.540	2.383	2.269	2.181	2.112	2.055	2.008
56	4.013	3.162	2.769	2.537	2.380	2.266	2.178	2.109	2.052	2.005
57	4.010	3.159	2.766	2.534	2.377	2.263	2.175	2.106	2.049	2.001
58	4.007	3.156	2.764	2.531	2.374	2.260	2.172	2.103	2.046	1.998
59	4.004	3.153	2.761	2.528	2.371	2.257	2.169	2.100	2.043	1.995
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993
61	3.998	3.148	2.755	2.523	2.366	2.251	2.164	2.094	2.037	1.990
62	3.996	3.145	2.753	2.520	2.363	2.249	2.161	2.092	2.035	1.987
63	3.993	3.143	2.751	2.518	2.361	2.246	2.159	2.089	2.032	1.985
64	3.991	3.140	2.748	2.515	2.358	2.244	2.156	2.087	2.030	1.982
65	3.989	3.138	2.746	2.513	2.356	2.242	2.154	2.084	2.027	1.980
66	3.986	3.136	2.744	2.511	2.354	2.239	2.152	2.082	2.025	1.977
67	3.984	3.134	2.742	2.509	2.352	2.237	2.150	2.080	2.023	1.975
68	3.982	3.132	2.740	2.507	2.350	2.235	2.148	2.078	2.021	1.973
69	3.980	3.130	2.737	2.505	2.348	2.233	2.145	2.076	2.019	1.971
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969
71	3.976	3.126	2.734	2.501	2.344	2.229	2.142	2.072	2.015	1.967
72	3.974	3.124	2.732	2.499	2.342	2.227	2.140	2.070	2.013	1.965
73	3.972	3.122	2.730	2.497	2.340	2.226	2.138	2.068	2.011	1.963
74	3.970	3.120	2.728	2.495	2.338	2.224	2.136	2.066	2.009	1.961
75	3.968	3.119	2.727	2.494	2.337	2.222	2.134	2.064	2.007	1.959
76	3.967	3.117	2.725	2.492	2.335	2.220	2.133	2.063	2.006	1.958
77	3.965	3.115	2.723	2.490	2.333	2.219	2.131	2.061	2.004	1.956
78	3.963	3.114	2.722	2.489	2.332	2.217	2.129	2.059	2.002	1.954
79	3.962	3.112	2.720	2.487	2.330	2.216	2.128	2.058	2.001	1.953
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951
81	3.959	3.109	2.717	2.484	2.327	2.213	2.125	2.055	1.998	1.950
82	3.957	3.108	2.716	2.483	2.326	2.211	2.123	2.053	1.996	1.948
83	3.956	3.107	2.715	2.482	2.324	2.210	2.122	2.052	1.995	1.947
84	3.955	3.105	2.713	2.480	2.323	2.209	2.121	2.051	1.993	1.945
85	3.953	3.104	2.712	2.479	2.322	2.207	2.119	2.049	1.992	1.944
86	3.952	3.103	2.711	2.478	2.321	2.206	2.118	2.048	1.991	1.943
87	3.951	3.101	2.709	2.476	2.319	2.205	2.117	2.047	1.989	1.941
88	3.949	3.100	2.708	2.475	2.318	2.203	2.115	2.045	1.988	1.940
89	3.948	3.099	2.707	2.474	2.317	2.202	2.114	2.044	1.987	1.939
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938
91	3.946	3.097	2.705	2.472	2.315	2.200	2.112	2.042	1.984	1.936
92	3.945	3.095	2.704	2.471	2.313	2.199	2.111	2.041	1.983	1.935
93	3.943	3.094	2.703	2.470	2.312	2.198	2.110	2.040	1.982	1.934
94	3.942	3.093	2.701	2.469	2.311	2.197	2.109	2.038	1.981	1.933
95	3.941	3.092	2.700	2.467	2.310	2.196	2.108	2.037	1.980	1.932
96	3.940	3.091	2.699	2.466	2.309	2.195	2.106	2.036	1.979	1.931
97	3.939	3.090	2.698	2.465	2.308	2.194	2.105	2.035	1.978	1.930
98	3.938	3.089	2.697	2.465	2.307	2.193	2.104	2.034	1.977	1.929
99	3.937	3.088	2.696	2.464	2.306	2.192	2.103	2.033	1.976	1.928
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927

Formula sheet

$$Mean = \frac{\sum x}{n} \qquad Variance = \frac{\sum (x-\bar{x})^2}{n-1}$$

$$JB = n\left(\frac{s^2}{6} + \frac{(k-3)^2}{24}\right) \qquad (\bar{x}_1 - \bar{x}_2) \pm z_{\frac{\propto}{2}} SE$$

$$SE = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \qquad SE = SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$SP = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \qquad TS = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

$$TS = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \qquad TS = \frac{\bar{x}_1 - \bar{x}_2}{SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$TS = \frac{\bar{d}}{\frac{\sigma_d}{\sqrt{n}}}$$

$$Coefficient\ of\ Correlation = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Normal Equations

$$Y = a + bx$$

$$\sum y = na + b\sum x$$

$$\sum xy = a\sum x + b\sum x^2$$

$$Sum\ of\ Square\ of\ Regression = \sum(\hat{Y} - \bar{Y})^2$$

$$Sum\ of\ Square\ of\ Residual = \sum(Y - \hat{Y})^2$$

$$Sum\ of\ Square\ of\ Total = \sum(Y - \bar{Y})^2$$

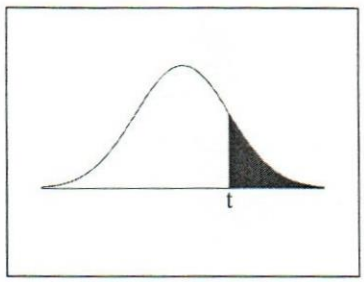
$$\bar{R}^2 = 1 - (1 - R^2)\frac{n-1}{n-k-1}$$

$$Sum\ of\ Square\ of\ Between\ groups = \sum(\bar{X} - \bar{\bar{X}})^2$$

$$Sum\ of\ Square\ of\ Within\ groups = \sum(X - \bar{X})^2$$

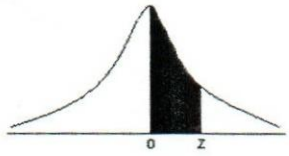
$$Sum\ of\ Square\ of\ Total = \sum(X - \bar{\bar{X}})^2$$

t-Distribution Table



The shaded area is equal to α for $t = t_\alpha$.

df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
32	1.309	1.694	2.037	2.449	2.738
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.434	2.719
38	1.304	1.686	2.024	2.429	2.712
∞	1.282	1.645	1.960	2.326	2.576



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49896	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983

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Econometrics – ECON0321

- This paper consists of EIGHT questions on EIGHT (08) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.
- Statistical tables and formulae sheets will be given

Date: 2020.09.16 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Select the correct answer and write that number in your answer script.

(a) Sample statistics that is used to estimate a parameter is called

i. Estimator ii. Estimate iii. Confidence

iv. Parameter

(b) The standard deviation of a Sample distribution is called.

i. Population standard deviation ii. Estimator

iii. Standard error iv. Parameter

(c) Which one is said by Central Limit Theorem?

i. Population mean is equal to the sample mean.

ii. Mean of the sample means is equal to the population mean

iii. Sample mean is equal to the population mean

iv. None of the above

(d) The numbers of values that are free to vary after restrictions have been placed on data.

i. Estimate ii. Estimator iii. Degree of freedom iv. Statistic

(e) The calculate value to the sample is called

i. Degrees of freedom ii. Parameter iii. Sample estimate

iv. Statistics

(f) If a hypothesis consists of single value that is called

i. Alternative hypothesis ii. Null hypothesis

iii. Simple hypothesis iv. Composite hypothesis

(g) Population parameter will be within a region according to some probability, this is called.

i. Significant levels ii. Critical points iii. Confidence coefficient

iv. Estimators

(h) Average weight and standard deviation of a sample size of 100 are respectively 50kg and 3.5kg. What is the standard error?

i. 0.35 ii. 0.035 iii. 2.85 iv. 5

(i) Management of a company says that no difference in weight between three products. Which technique is appropriate to test this statement?

i. Independent sample t test ii. Paired sample t test

iii. One sample t test iv. One way ANOVA

(j) Coefficient of determination in the regression model is 0.81. Size of the sample is 10. What is the coefficient of multiple correlation.

i. 0.54 ii. 0.9 iii. 0..65 iv. 0.61

(02×10 = 20 Marks)

Question 02

(a) Briefly describe econometrics and financial econometrics.

(10 Marks)

(b) Describe the traditional econometric methodology with an example

(10 Marks)

Question 03

(a) Describe six assumptions of Classical Linear Regression Model (CLRM)?

(12 Marks)

(b) Why we test stationary of data in time series models?

(08 Marks)

Question 04

(a) Management of a manufacturing company says that average weight of their product is 30kg. Selecting 12 items, weight has been estimated and information is provided by the following table.

30.2	29.5	29.1	30.3	29.2	30.4	28.7	29.1	30.1	29.2	30.3	29.2

(i) Test the statement of the management.

(06 Marks)

(ii) Estimate the confidence interval of the difference.

(02 Marks)

(b) Management of two companies say that there is no difference in weight between the two types of brands. Following table provides information about the weight of 10 items from each brand.

Brand 1	29.0	29.3	29.1	28.9	28.8	29.3	28.7	28.9	28.9	29.0
Brand 2	29.4	28.5	28.9	29.1	28.7	28.9	29.0	29.7	29.1	28.6

(12 Marks)

Question 05

(a) What is the importance of one way Analysis of Variance (ANOVA)

(05 Marks)

(b) Three products have been grouped as category "A", category "B" and category "C" according to the demand. Selecting five items from each category, quality has been tested and marks have been given to each item out of 15. Result is provided by the following table. Construct one way ANOVA and test whether there is a difference in the quality between at least two categories.

Category "A"	Category "B"	Category "C"
12	09	07
14	11	10
10	07	06
09	12	09
15	11	08

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(15 Marks)

Question 06

Following data are provided for six years of exports income and foreign reserves in developing company.

Exports.(Rs. Billion)	Reserves (Rs. Mn)
3	20
4	30
5	30
5	50
6	60
7	50

(a) Interpret the relationship between export income and foreign reserves.

(06 Marks)

(b) Construct linear regression model for the data.

(06 Marks)

(c) Construct Regression ANOVA table and interpret the results.

(06 Marks)

(d) Calculate R square and interpret the results.

(02 Marks)

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Question 07

(a) Write Augmented Dickey Fuller (ADF) unit root test to examine random walk with drift and trend for Exchange Rate (ER).

(06 Marks)

(b) What are the critics in VAR models?

(06 Marks)

(c) Interpret the following Augmented Dickey Fuller unit root test results.

Variables	Probability at level	Probability at first difference
Exchange Rate (ER)	0.3122	0.004
Exports (EX)	0.6537	0.000
Imports (IM)	0.8812	0.000

(03 Marks)

(d) Selecting two period lag length and two co-integration equations, Vector Auto Regressive Model (VECM) has been constructed below. Interpret the VECM results.

Dependent Variable: D(ER)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.090185	0.014951	-6.032030	0.0000
C(2)	0.106123	0.104176	1.018694	0.3185
C(3)	0.271966	0.213519	1.273736	0.2150
C(4)	-0.053465	0.207416	-0.257765	0.7988
C(5)	0.085367	0.167986	0.508183	0.6160

C(6)	0.007186	0.161709	0.044440	0.9649
C(7)	0.081490	0.136036	0.599035	0.5548
C(8)	-0.089414	0.144066	-0.620646	0.5407
C(9)	0.096953	0.060768	1.595454	0.1237

		Mean dependent	
R-squared	0.215519	var	0.140459
Adjusted R-squared	-0.045975	S.D. dependent var	0.051826
		Akaike info	
S.E. of regression	0.053004	criterion	-2.809908
Sum squared resid	0.067426	Schwarz criterion	-2.401769
		Hannan-Quinn	
Log likelihood	55.36348	criter.	-2.672582
F-statistic	0.824185	Durbin-Watson stat	1.837371
Prob(F-statistic)	0.589577		

(05 Marks)

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Question 08

Write short notes on followings.

(a) Random walk of data

(b) Homoscedasticity

(c) Normality of residuals

(d) Serial correlation

(e) Cointegration

(20 Marks)

----------END OF THE QUESTION PAPER----------

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
51	4.030	3.179	2.786	2.553	2.397	2.283	2.195	2.126	2.069	2.022
52	4.027	3.175	2.783	2.550	2.393	2.279	2.192	2.122	2.066	2.018
53	4.023	3.172	2.779	2.546	2.389	2.275	2.188	2.119	2.062	2.015
54	4.020	3.168	2.776	2.543	2.386	2.272	2.185	2.115	2.059	2.011
55	4.016	3.165	2.773	2.540	2.383	2.269	2.181	2.112	2.055	2.008
56	4.013	3.162	2.769	2.537	2.380	2.266	2.178	2.109	2.052	2.005
57	4.010	3.159	2.766	2.534	2.377	2.263	2.175	2.106	2.049	2.001
58	4.007	3.156	2.764	2.531	2.374	2.260	2.172	2.103	2.046	1.998
59	4.004	3.153	2.761	2.528	2.371	2.257	2.169	2.100	2.043	1.995
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993
61	3.998	3.148	2.755	2.523	2.366	2.251	2.164	2.094	2.037	1.990
62	3.996	3.145	2.753	2.520	2.363	2.249	2.161	2.092	2.035	1.987
63	3.993	3.143	2.751	2.518	2.361	2.246	2.159	2.089	2.032	1.985
64	3.991	3.140	2.748	2.515	2.358	2.244	2.156	2.087	2.030	1.982
65	3.989	3.138	2.746	2.513	2.356	2.242	2.154	2.084	2.027	1.980
66	3.986	3.136	2.744	2.511	2.354	2.239	2.152	2.082	2.025	1.977
67	3.984	3.134	2.742	2.509	2.352	2.237	2.150	2.080	2.023	1.975
68	3.982	3.132	2.740	2.507	2.350	2.235	2.148	2.078	2.021	1.973
69	3.980	3.130	2.737	2.505	2.348	2.233	2.145	2.076	2.019	1.971
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969
71	3.976	3.126	2.734	2.501	2.344	2.229	2.142	2.072	2.015	1.967
72	3.974	3.124	2.732	2.499	2.342	2.227	2.140	2.070	2.013	1.965
73	3.972	3.122	2.730	2.497	2.340	2.226	2.138	2.068	2.011	1.963
74	3.970	3.120	2.728	2.495	2.338	2.224	2.136	2.066	2.009	1.961
75	3.968	3.119	2.727	2.494	2.337	2.222	2.134	2.064	2.007	1.959
76	3.967	3.117	2.725	2.492	2.335	2.220	2.133	2.063	2.006	1.958
77	3.965	3.115	2.723	2.490	2.333	2.219	2.131	2.061	2.004	1.956
78	3.963	3.114	2.722	2.489	2.332	2.217	2.129	2.059	2.002	1.954
79	3.962	3.112	2.720	2.487	2.330	2.216	2.128	2.058	2.001	1.953
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951
81	3.959	3.109	2.717	2.484	2.327	2.213	2.125	2.055	1.998	1.950
82	3.957	3.108	2.716	2.483	2.326	2.211	2.123	2.053	1.996	1.948
83	3.956	3.107	2.715	2.482	2.324	2.210	2.122	2.052	1.995	1.947
84	3.955	3.105	2.713	2.480	2.323	2.209	2.121	2.051	1.993	1.945
85	3.953	3.104	2.712	2.479	2.322	2.207	2.119	2.049	1.992	1.944
86	3.952	3.103	2.711	2.478	2.321	2.206	2.118	2.048	1.991	1.943
87	3.951	3.101	2.709	2.476	2.319	2.205	2.117	2.047	1.989	1.941
88	3.949	3.100	2.708	2.475	2.318	2.203	2.115	2.045	1.988	1.940
89	3.948	3.099	2.707	2.474	2.317	2.202	2.114	2.044	1.987	1.939
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938
91	3.946	3.097	2.705	2.472	2.315	2.200	2.112	2.042	1.984	1.936
92	3.945	3.095	2.704	2.471	2.313	2.199	2.111	2.041	1.983	1.935
93	3.943	3.094	2.703	2.470	2.312	2.198	2.110	2.040	1.982	1.934
94	3.942	3.093	2.701	2.469	2.311	2.197	2.109	2.038	1.981	1.933
95	3.941	3.092	2.700	2.467	2.310	2.196	2.108	2.037	1.980	1.932
96	3.940	3.091	2.699	2.466	2.309	2.195	2.106	2.036	1.979	1.931
97	3.939	3.090	2.698	2.465	2.308	2.194	2.105	2.035	1.978	1.930
98	3.938	3.089	2.697	2.465	2.307	2.193	2.104	2.034	1.977	1.929
99	3.937	3.088	2.696	2.464	2.306	2.192	2.103	2.033	1.976	1.928
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927

Formula sheet

$$Mean = \frac{\sum x}{n} \qquad Variance = \frac{\sum (x-\bar{x})^2}{n-1}$$

$$JB = n\left(\frac{s^2}{6} + \frac{(k-3)^2}{24}\right) \qquad (\bar{x}_1 - \bar{x}_2) \pm z_{\frac{\propto}{2}} SE$$

$$SE = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \qquad SE = SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$SP = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \qquad TS = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

$$TS = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \qquad TS = \frac{\bar{x}_1 - \bar{x}_2}{SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$TS = \frac{\bar{d}}{\frac{\sigma_d}{\sqrt{n}}}$$

$$Coefficient\ of\ Correlation = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Normal Equations

$$Y = a + bx$$

$$\sum y = na + b\sum x$$

$$\sum xy = a\sum x + b\sum x^2$$

$$Sum\ of\ Square\ of\ Regression = \sum(\hat{Y} - \bar{Y})^2$$

$$Sum\ of\ Square\ of\ Residual = \sum(Y - \hat{Y})^2$$

$$Sum\ of\ Square\ of\ Total = \sum(Y - \bar{Y})^2$$

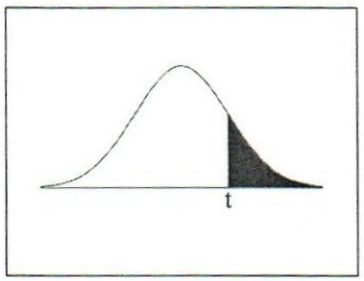
$$\bar{R}^2 = 1 - (1 - R^2)\frac{n-1}{n-k-1}$$

$$Sum\ of\ Square\ of\ Between\ groups = \sum(\bar{X} - \bar{\bar{X}})^2$$

$$Sum\ of\ Square\ of\ Within\ groups = \sum(X - \bar{X})^2$$

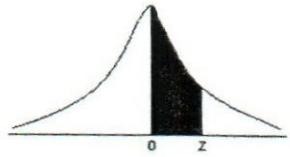
$$Sum\ of\ Square\ of\ Total = \sum(X - \bar{\bar{X}})^2$$

t-Distribution Table



The shaded area is equal to α for $t = t_\alpha$.

df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
32	1.309	1.694	2.037	2.449	2.738
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.434	2.719
38	1.304	1.686	2.024	2.429	2.712
∞	1.282	1.645	1.960	2.326	2.576



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49896	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983

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Year 3 Semester II

SEMETSER END EXAMINATION

Production and Operations Management – POMG0368

- This paper consists of EIGHT questions on NINE (09) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.
- Formulae sheet is attached.

Date: 2020.09.13 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) A building contractor's records during the last five weeks indicate the number of job requests:

Table 1:1-Job Requests

Week	1	2	3	4	5
Requests	20	22	18	21	22

Predict the number of requests for week 6 using exponential smoothing with α = 0.3. Use 20 for week 2 forecast. (04 Marks)

(b) Air travel on Mountain Airlines for the past 18 weeks was as below

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Table 1:2 – Passengers

Week	Passengers	Week	Passengers
1	405	10	440
2	410	11	446
3	420	12	451
4	415	13	455
5	412	14	464
6	120	15	466
7	124	16	474
8	433	17	476
9	438	18	482

Use the trend projection technique to develop a forecast for the next three weeks.

(08 Marks)

(c) Using the following information, the Branch Manager of a Tourist Centre wants to predict the first quarter of next year demand for the purpose of writing a report to Top Management.

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Table 1:3 – Seasonal Relatives

Month	Seasonal Relative	Month	Seasonal Relative
Jan	1.2	Jul	0.8
Feb	1.3	Aug	0.6
Mar	1.3	Sep	0.7
Apr	1.1	Oct	1.0
May	0.8	Nov	1.1
Jun	0.7	Dec	1.4

The monthly forecast equation being used is:

$F_t = 402 + 3t$

Where

t_0 = January of last year

F_t = Number of arrivals

Determine the number of arrivals of the first three months of next year. (08 Marks)

Question 02

(a) Discuss the difference between the cost of inputs and the value or price of outputs in operations management. (05 Marks)

(b) Define the term "Value Added" in Operations Management. (06 Marks)

(c) Identify the three major types of production facilities and describe each of them. (09 Marks)

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Question 03

(a) Identify the four trends of product and service design. (04 Marks)

(b) Breifly explain two activities of product and service design. (06 Marks)

(c) Identify the five reasons for product and service design and explain two. (10 Marks)

Question 04

(a) A small firm produces and sells automotive items in a five-state area. The firm, expects to consolidate assembly of its battery charges line at a single location. Currently, operations are in three widely scattered locations. The leading candidate for location will have a monthly fixed cost of $42,000 and variable costs of $3 per charger. Charges sell for $7 each.

(i) Perepare a table that shows total profits, fixed costs, variable costs, and revenues for monthly volumes of 10,000, 12,000, and 15,000 units. (03 Marks)

(ii) What is the break-even point? (03 Marks)

(ii) Determine profit when volume equals 22,000 units. (03 Marks)

(b) The owner of Old-Fashioned Berry Pies, S. Simon, is contemplating adding a new line of pies, which will require leasing new equipment for a monthly payment of $6000. Variable costs would be $2.00 per pie, and pies would retail for $7.00 each.

(i) How many pies must be sold in order to break even? (02 Marks)

(ii) What would the profit (loss) be if 1,000 pies are made and sold in a month? (03 Marks)

(iii) How many pies must be sold to realize a profit of $4,000? (03 Marks)

(iv) If 2,000 can be sold, and a profit target is $5,000, what price should be charged per pie? (03 Marks)

Question 05

For the set of tasks given below, do the following:

(a) Develop the precedence diagram. (02 Marks)

(b) Determine the minimum and maximum cycle times in seconds for a desired output of 500 units in a 7-hour day. Why might a manager use a cycle time of 50 seconds? (03 Marks)

(c) Determine the minimum number of workstations for output of 500 units per day. (02 Marks)

(d) Balance the line using the largest popsitional weight heuristic. Break ties with the most following tasks heuristic. Use a cycle time of 50 seconds. (10 Marks)

(e) Calclate the percentage idle time for the line. (03 Marks)

Table 5:1-Task Time

Task	Task Time (Seconds)	Immediate Predecessors
A	45	-
B	11	A
C	9	B

D	50	-
E	26	D
F	11	E
G	12	C
H	10	C
I	9	F, G, H
J	10	I
	193	

Question 06

SummerFun, Inc., produces a variety of recreation and leisure products. The production manager has developed an aggregate forecast:

Month	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
Forecast	50	44	55	60	50	40	51	350

Use the following information to develop aggregate plans.

Regular Production cost	Rs. 80 per Unit
Overtime Production cost	Rs. 120 per Unit
Regular capacity	40 units per month
Overtime capacity	8 units per month
Subcontracting cost	Rs. 140 per Unit
Subcontracting capacity	12 units per month

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Holding cost	Rs. 10 per unit per month
Back -order cost	Rs. 20 per Unit
Beginning Inventory	0 units

Develop an aggregate plan using regular production. Supplement using inventory, overtime and subcontracting as needed. No backlogs allowed. (20 Marks)

Question 07

Assume that you are a manager. You have received an order of 40 units of machines, which is to be delivered at the start of week 7 of your schedule. You already have 10 Machines in the inventory. A Machine consists of three components: B, C & G. One B, one G and three Cs are used to make this product. Company needs two weeks to assemble Machines. Using the following information;

(a) Develop a product structure tree for the machine. (02 Marks)

(b) Determine how many units of components G should be ordered and the timing of those orders, given that both components G & C must be ordered in multiples of 80 units. Assume that components are used only for this particular machine.

Item	LT(Weeks)	On Hand	Components
B	1	5	E,F
C	1	20	G(2), H
E	2	4	

F	3	8	
G	2	15	
H	1	10	

(18 Marks)

Question 08

(a) Breifly explain the need for methods analysis. (02 Marks)

(b) Breifly describe two charts that are used in method analysis. (06 Marks)

(c) Breifly explain the motion study principles. (06 Marks)

(d) How to identify a qualified worker? (06 Marks)

----------END OF THE QUESTION PAPER----------

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Formula Sheet

Simple Moving Average

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots.. + D_{t-n+1}}{n}$$

D_t : actual demand in period *t*

n : number of periods in the average

1. **Weighted Moving Average**

$$T_{t+1} = W_1D_1 + W_2D_{t-1} + \ldots + W_nD_{t-n+1}$$

2. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant ($0 \leq \alpha \geq 1$)

4. **Trend Projections**

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2} \qquad a = \bar{y} - b\bar{x}$$

5. **Exponential Smoothing with Trend Adjustment**

$$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$$

$$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$$

$$FIT_t = F_t + T_t$$

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Year 3 Semester II

SEMETSER END EXAMINATION

Port Planning – PLUT0250

- This paper consists of EIGHT questions on TWO (02) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2020.09.11 Pass mark: 50% Time: 03 Hours

Question 01 (compulsory)

(a) List out different state of the art container terminal handling equipments? (10 Marks)

(b) Why SLPA build Colombo South Harbour and what are the saliant features? (10 Marks)

Question 02

You are now an expert in port management, operation & planning filed. Your expertise is required to finalize a master plan for the Port of Hambantota.

Draw a master plan & zone out areas for differenct types of cargo handling termnals and industrial areas? (20 Marks)

Question 03

List & describe current port challenges to be addressed by Port Planners in port expansion, new port building and managing ports/terminals?

(20 Marks)

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Question 04

Commercial ports in Sri Lanka are owned by Sri Lanka Ports Authority (SLPA). New port building & port expansion projects should be aligned with the Government Vision to make Sri Lanka a Maritime & Logistic Hub.

(a) Describe SLPA Vision & Mission (10 Marks)

(b) What are the port development projects planned in Sri Lanka & describe port projects? (10 Marks)

Question 05

Draw and describe facilities for an Automobile Handling Ro-RO Terminal aiming mainly to handle transshipments?

(20 Marks)

Question 06

What are the advanced navigational facilities that can be considered to use in a new port facility planning? (20 Marks)

Question 07

Select one of the cargo handling terminals and draw and describe a full terminal layout to handled three ships at any given time & name terminal facilities?

(a) Liquid Bulk Handling Terminal

(b) Dry Bulk Handling Terminal

(c) Cruise Terminal

(20 Marks)

Question 08

Select one country and describe the port projects and the impacts to Sri Lankan Ports?

(a) Indian

(b) Singapore

(c) Malaysia

(d) UAE - United Arab Emirates

(e) Oman (20 Marks)

----------END OF THE QUESTION PAPER----------

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Course CODE: COM550

Year 3 Semester II

REPEAT EXAMINATION

Production and Operations Management – POMG0368

- This paper consists of EIGHT questions on NINE (09) pages
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Formulae sheet is attached

Date: 2019.12.05 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) ABC corporation sells radio frequency inventory tags. Monthly sales for a seven-month period were as follows:

Table 1.1 : Sales

Month	Sales (000 units)
Feb	19
Mar	18
Apr	15
May	20
Jun	18
Jul	22
Aug	20

i. Plot the monthly data on a sheet of graph paper. (02 Marks)

ii. Forecast September sales volume using each of the following;

a. A linear trend equation (02 Marks)

b. A five-month moving average (02 Marks)

c. Exponential smoothing with a smoothing constant equal to 0.20, assuming a march forecast of 19(000) (02 Marks)

d. The naïve approach (02 Marks)

e. A weighted average using 0.60 for August, 0.30 for July, and 0.10 for June. (02 Marks)

(b) Freight car loadings over a 12-year period at a busy port are as follows;

Table 1.2: Freight Car Loadings

Week	Number	Week	Number	Week	Number
1	220	7	350	13	460
2	245	8	360	14	475
3	280	9	400	15	500
4	275	10	380	16	510
5	300	11	420	17	525
6	310	12	450	18	541

i. Determine a linear trend line for freight car loadings. (02 Marks)

ii. Use the trend equation to predict loadings for weeks 20 and 21. (02 Marks)

iii. The manager intends to install new equipment when the volume exceeds 800 loadings per week. Assuming the current trend continues, the loading volume will reach that level approximately in which week? (04 Marks)

Question 02

(a) An electrical contractor uses exponential smoothing to forecast equipment usage at its main branch. August usage was forecast to be 88 percent of capacity; actual usage was 89.6 percent of capacity. A smoothing constant of 0.1 is used.

(i) Prepare a forecast for September. (04 Marks)

(ii) Assuming actual September usage of 92 percent, prepare a forecast for October usage. (04 Marks)

(b) Obtain the linear trend equation for the following data on new checking accounts at a savings bank and use it to predict new checking accounts for periods 16 through 19.

Table 2.1 : New Accounts

Period	New Accounts	Period	New Accounts
1	200	9	253
2	214	10	267
3	211	11	281
4	228	12	275
5	235	13	280
6	232	14	288
7	248	15	310
8	250		

(06 Marks)

(c) The following data represent the industry sales(x) and corporation ABC's annual sales (y) of toddler clothes.

Table 2.2 – Sales

Year	Industry sales (X) ($ millions)	ABC's Sales (Y) ($ millions)
1	1103	105
2	1250	117
3	1097	110
4	955	101
5	945	97
6	903	92
7	1025	104
8	1170	116

If the industry estimate of next year's sales is $1300 million, forecast ABC's annual sales for next year using casual linear regression. (06 Marks)

Question 03

(a) Breifly describe the term "Operations Management". (03 Marks)

(b) Identify the three major functional areas of business organizations and briefly describe how they interrelate. (07 Marks)

(c) Many organizations offer a combination of goods and services to their customers. There are some key differences between production of goods and delivery of services. What are the implications of these differences relative to managing operations? (10 Marks)

Question 04

(a) Identify two types of researches in Operations Management. (03 Marks)

(b) Identify five reasons for product and service design. (05 Marks)

(c) Briefly explain two trends in product and service design. (06 Marks)

(d) Briefly explain two sources of ideas for product and service design. (06 Marks)

Question 05

For the set of tasks given below, do the following:

(a) Develop the precedence diagram. (03 Marks)

(b) Determine the minimum and maximum cycle times in seconds for a desired output of 500 units in a 7-hour day. Why might a manager use a cycle time of 50 seconds? (02 Marks)

(c) Determine the minimum number of workstations for output of 500 units per day. (03 Marks)

(d) Balance the line using the largest popsitional weight heuristic. Break ties with the most following tasks heuristic. Use a cycle time of 50 seconds. (10 Marks)

(e) Calclate the percentage idle time for the line. (02 Marks)

Table 5.1: Task Time

Task	Task Time (Seconds)	Immediate Predecessors
A	45	-
B	11	A
C	9	B
D	50	-
E	26	D
F	11	E
G	12	C
H	10	C

I	9	F, G, H
J	10	I
	193	

Question 06

(a) A small firm produces and sells automotive items in a five-state area. The firm, expects to consolidate assembly of its battery charges line at a single location. Currently, operations are in three widely scattered locations. The leading candidate for location will have a monthly fixed cost of $42,000 and variable costs of $3 per charger. Charges sell for $7 each.

(i) Perepare a table that shows total profits, fixed costs, variable costs, and revenues for monthly volumes of 10,000, 12,000, and 15,000 units. (04 Marks)

(ii) What is the break-even point? (02 Marks)

(ii) Determine profit when volume equals 22,000 units. (02 Marks)

(b) The owner of Old-Fashioned Berry Pies, S. Simon, is contemplating adding a new line of pies, which will require leasing new equipment for a monthly payment of $6000. Variable costs would be $2.00 per pie, and pies would retail for $7.00 each.

(i) How many pies must be sold in order to break even? (02 Marks)

(ii) What would the profit (loss) be if 1,000 pies are made and sold in a month? (02 Marks)

(iii) How many pies must be sold to realize a profit of $4,000? (04 Marks)

(iv) If 2,000 can be sold, and a profit target is $5,000, what price should be charged per pie? (04 Marks)

Question 07

A manager is attempting to put together an aggregate plan for the coming nine months. She has obtained a forecast of expected demand for the planning horizon. The plan must deal with highly seasonal demand; demand is relatively high in periods 3 and 4 and again in period 8, as can be seen from the following forecasts:

Period	1	2	3	4	5	6	7	8	9	Total
Forecast	190	230	260	280	210	170	160	260	180	1940

The department now has 20 full-time employees, each of whom can produce 10 units of output period at a cost of Rs. 6 per unit. Inventory carrying cost is RS. 5 per unit per period, and backlog cost is Rs. 10 per unit per period. The manager is considering a plan that would involve hiring two people to working in period 1, one on a temporary basis who would work only through period 5. This would cost Rs.500 in addition to unit production costs.

(a) Determine the total cost of the plan, including production, inventory, and back-order costs. (20 Marks)

Question 08

(a) Define a "Qualified Worker" and "Standard Performance" according to Work Measurement in Job Design. (06 Marks)

(b) Time study of a work operation yielded an average observed time of 1.05 minutes. The analyst rated the observed worker at 75%. The firm uses a 11% allowance factor. Compute the standard time. (06 Marks)

(c) The data in the table below represent time study observations for a woodworking operation. Based on the observations, determine the standard time for the operation, assuming an allowance of 7 percent of job time.

Table 8.1: Element Time

Element	Performance Rating	Observations (Minutes per Cycle)					
		1	2	3	4	5	6
1	85%	1.11	1.21	0.85	1.01	1.31	1.22
2	95%	1.46	1.26	1.45	1.35	3.56*	1.12
3	97%	0.22	0.35	0.32	2.92*	0.60	0.52

***Unusual delay, disregard time.**

(08 Marks)

----------END OF THE QUESTION PAPER----------

Formula Sheet

Simple Moving Average

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots + D_{t-n+1}}{n}$$

D_t : actual demand in period t

n : number of periods in the average

1. **Weighted Moving Average**

$$T_{t+1} = W_1D_1 + W_2D_{t-1} + \ldots + W_nD_{t-n+1}$$

2. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant $(0 \leq \alpha \geq 1)$

4. **Trend Projections**

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2} \qquad a = \bar{y} - b\bar{x}$$

5. **Exponential Smoothing with Trend Adjustment**

$$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$$

$$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$$

$$FIT_t = F_t + T_t$$

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Year 3 Semester II

REPEAT EXAMINATION

Project Management – PMGT0364

- This paper consists of EIGHT questions on FIVE (05) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Formulae sheet is attached.

Date: 2019.12.04 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) List four difference between projects and operations. (04 Marks)

(b) Identify and explain the triple constraints for projects? (06 Marks)

(c) Identify the three main organizational structures and explain benefits from one structures to projects from the characteristics of that structure. (06 Marks)

(d) List four project management knowledge areas. (04 Marks)

Question 02

(a) Briefly explain why projects are initiated in a business environment (05 Marks)

(b) Project Ace requires an initial investment of $300,000 and is expected to generate the following net cash inflows:

Table 1.00: Project Ace, cash inflows

Year	Net cash inflow ($)

Year 1	200,000
Year 2	60,000
Year 3	50,000
Year 4	40,000
Year 5	40,000

i. Calculate the payback period for project Ace. (03 Marks)

ii. Calculate the Net Cash Flow for project Ace considering that discount rate applicable for this project in 10%. (05 Marks)

(c) Briefly explain why feasibility study is important for a project and list five areas of feasibility. (07 Marks)

Question 03

(a) Identify two non-financial project selection models and explain one model. (04 Marks)

(b) Describe four items in the project scope checklist that ensures the scope of a project is comprehensive. (08 Marks)

(c) Identify five characteristics of a "work package" in a "Work Breakdown Structure" and explain what a sub-deliverable is related to "Work Breakdown Structure". (08 Marks)

Question 04

(a) Identify a practical project related to transport and logistics industry and identify 10 stakeholders for that project. (05 Marks)

(b) Identify the steps in developing a project communication plan. Relate to the example in question 04 (a) when possible. (10 Marks)

(c) Explain why it is important to have a proper communication plan for the success of any project. (05 Marks)

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Question 05

(a) Explain why estimates are important for any project. (04 Marks)

(b) Describe four ways how you could increase the accuracy of estimates. (08 Marks)

(c) Identify and describe four reasons to adjust the estimates along the project. (08 Marks)

Question 06

A project is specified by activities A, B, C, D, E, F and G. Following Table 2.00 represents the nature of the relationships and relevant lags among these activities.

Table 2.00: Activity relationships.

Activity	Preceding Activity	Activity Duration
A	-	10
B	A	5
C	A	10
D	B	5
E	B,C	3
F	C	5
G	D,E,F	10
H	E,F	11
I	G,H	4

(a) Draw the network diagram to represent the project. (06 Marks)

(b) Calculate the Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF) and Slack (SL) for activities A, B, D, F, G and H. (12 Marks)

(c) Identify the activities in the critical path. (02 Marks)

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Question 07

(a) List the four stages of risk management process. (04 Marks)

(b) Explain the concept of "Risk breakdown structure". (04 Marks)

(c) Explain the four main risk response strategies. (08 Marks)

(d) Why do you think it is important to have contingency plans for projects? (04 Marks)

Question 08

(a) Explain three types of closures a project could have. (06 Marks)

(b) Explain four activities to be done during the closure phase of a project. (08 Marks)

(c) Explain two barriers for retrospective after the closure of a project and explain one method to overcome. (06 Marks)

----------END OF THE QUESTION PAPER----------

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***Attachments* Payback**

A = Last year with a negative cumulative cash flow, B = Remaining value of negative cumulative cash flow at the end of the period A, C = Cash inflow during the period following period A.

$$\text{Payback} = A + \frac{B}{C}$$

1. **Present Value**

When i=*Discount rate* and n=*Year numbe.*

$$Present\ Value = \frac{Cash\ flow}{(1+i)^n}$$

2. Present Value table

Present value of \$1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

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Year 3 Semester II

REPEAT EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT (08) questions on NINE (09) pages
- Answer FIVE questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Use MCQ sheet to answer Question 01.

Date: 2019.12.03 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

1. In linear programming, constraints can be represented by

   (A) equalities
   (B) inequalities
   (C) ratios
   (D) both a and b

2. One subset which satisfies inequality part of equation is graphically represented by

   (A) domain area of y intercept
   (B) range area of x intercept
   (C) straight line
   (D) shaded area around straight line

3. For linear inequalities, solution set for a group of inequalities is classified as

   (A) concave set
   (B) convex set
   (C) loss set

(D) profit set

4. Feasible region's optimal solution for a linear objective function always includes

(A) downward point
(B) upward point
(C) corner point
(D) front point

5. Linear inequalities are graphically represented on Cartesian plane by a

(A) negative full space
(B) closed half space
(C) open half space
(D) positive full space

6. In profit objective function, all lines representing same level of profit are classified as

(A) iso-objective lines
(B) iso-function lines
(C) iso-profit lines
(D) iso-cost lines

7. In transportation models designed in linear programming, points of demand is classified as

(A) ordination
(B) transportation
(C) destinations
(D) origins

8. What is the cost of the transportation solution shown in the table?

	W	X	Y	Supply
A	\$3 20	\$5 50	\$9 0	70
B	\$5 0	\$4 30	\$7 0	30
C	\$10 40	\$8 0	\$3 80	120
Demand	60	80	80	220

(A)\$1350

(B) \$1070

(C)\$1230

(D)\$1150

9. An initial transportation solution appears in the table given below.

	C	D	Factory Capacity
A	10	0	10
B	15	25	40
Warehouse Demand	25	25	50

Can this solution be improved if it costs \$5 per unit to ship from A to C; \$7 per unit to ship from A to D; \$8 to ship from B to C; and \$9 to ship from B to D?

(A)Yes, the initial solution can be improved by \$10.

(B) No, this solution is optimal.

(C) Yes, this solution can be improved by \$50.

(D)Yes, this solution can be improved by \$100.

10. The transportation method assumes that .....

(A) there are no economies of scale if large quantities are shipped from one source to one destination.

(B) the number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns in the table plus 1

(C) there is only one optimal solution for each problem.

(D) the number of dummy sources equals the number of dummy destinations.

Question 02

(a) Write the assumptions of Linear Programming. (02 Marks)

(b) A big hospital has the following minimal daily requirements of doctors:

Period	Time Duration	No. Of Doctors required
1	6 a.m. – 10a.m.	72
2	10 a.m. – 2 p.m.	77
3	2 p.m. – 6 p.m.	85
4	6 p.m. - 10 p.m.	68
5	10 p.m. – 2 a.m.	25
6	2 a.m. – 6 a.m.	22

Doctors report to the hospital at the begging of each period and work for 08 consecutive hours. Formulate a Linear Programming model to minimize the total

number of doctors to meet the needs of the hospital throughout the day.

(18 Marks)

Question 03

(a) Define the following terms in the contest of Linear Programming

(i) Infeasible Solution
(ii) Unbounded Solution
(iii) Multiple Optimal Solution (03 Marks)

(b) 'Rich Cereal Farm' uses at least 800 units of special feed daily. The special feed is a mixture of corn and soyabean meal with the following compositions:

Table 2

feedstuff	units per feedstuff		Cost (USD per unit)
	Protein	Fiber	
Corn	0.09	0.02	0.30
Soyabean meal	0.60	0.06	0.90

The dietary requirements of the special feed are at least 30% protein and at most 5% fiber. Rich Cereal Farm wants to determine the daily minimum cost feed mix.

(i) Formulate a LP model. (05 Marks)
(ii) Find the optimum product mix using Graphical Method. (12 Marks)

Question 04

Use simplex method to solve the following LP problem. (20 Marks)

Max $Z = 3X_1 + 5X_2 + 4X_3$

Subject to the constraints

$2X_1 + 3X_2 \leq 8$

$2X_2 + 5X_3 \leq 10$

$3X_1 + 2X_2 + 4X_3 \leq 15$

$X1, X2, X3 \geq 0$

Question 05

(a) Explain when we need to use 2 phase method. (04 Marks)

(b) Use 2 phase method and solve the following Linear Programming Problem by clearly stating the phase I objective function. (16 Marks)

MIN = 5X1 + 8X2

Subject to:

3X1 + 10X2 = 60

10X1 + 6X2 ≤ 110

4X1 + 7X2 ≥ 40

X1, X2 ≥ 0

Question 06

MAX z = 3X + 6X2 + 4X2

Subject to

X1 + 2X2 + X3 ≤ 10

3X1 + 3X2 + 2X3 ≤ 10

X1, X2, X3 ≥ 0

(a) Construct the dual problem, for this primal problem. (04 Marks)

(b) Solve the **primal and dual problems** using any appropriate method/s. (8*2 Marks)

Question 07

Consider a transportation problem where items should be transported from 03 warehouses to 4 sales outlets.

Table 4

		Sales Outlets				Supply
		S1	S2	S3	S4	
Warehouses	W1	3	1	7	4	300
	W2	2	6	5	9	400
	W3	80	3	3	2	500
Demand		250	350	400	200	

(a) Using North West Corner method find the initial transportation schedule. (05 Marks)

(b) Find the optimal transportation schedules using any appropriate method. (12 Marks)

(c) Evaluate the minimum transportation cost. (03 Marks)

Question 08

(a) Consider a technical support centre where personnel take telephone calls and provide services. The time between telephone calls (arrivals) ranges from 1 to 4 minutes, with distribution as shown in Table 5. There are two technical support persons A and B. ***A is more experienced and can provide services faster than B.*** The distributions of their service times are shown in Table 6 and 7.

Considering the following random numbers simulate the above and discuss the followings:

(i) Distribution of each caller delay to get the service and average waiting time.

(ii) Probability of waiting time

(iii) Probability of waiting time for both A and B.

Random numbers for arrivals: 89, 24, 56, 60, 34, 92, 45, 40, 8, 73

Random numbers for A: 88, 63, 23, 94, 74, 17, 11

Random numbers for B: 42, 53, 93, 24, 45

Table 5: Distribution of Time between arrivals

Time between arrivals (in minutes)	Probability
1	0.25
2	0.40
3	0.20
4	0.15

Table 6: Distribution of Service time for A

Service Time (in minutes)	Probability
2	0.30
3	0.28
4	0.25
5	0.17

Table 7: Distribution of Service time for B

Time between arrivals (in minutes)	Probability
3	0.35
4	0.25
5	0.20
6	0.20

(20 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II
REPEAT EXAMINATION
Operational Research – ORSH0372
MCQ Answer Sheet

- Cross (×) the relavant box according to your answer

Date: 2019.12.03 | Pass mark: 50% | Time: 03 Hours

Question 01

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D

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Year 3 Semester II
REPEAT EXAMINATION
Operational Research – ORSH0372
MCQ Answer Sheet

- Cross (x) the relavant box according to your answer

Date: 2019.12.03 Pass mark: 50% Time: 03 Hours

Question 01

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D

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Course CODE: COM550

Year 3 Semester II

REPEAT EXAMINATION

Customs and Commodity Inspections Operations – CCIO0234

- This paper consists of EIGHT questions on FIVE (05) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Required supporting documents are attached to the question paper.

Date: 2019.12.02 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Bell Lanka is a Sri Lankan trading company registered with Registrar of Companies under the Companies Act of Sri Lanka. However, 98% of shares of Bell Lanka are held by the Bell Group which is a USA based multinational company and the rights holder of several world-famous brands of whiskies. Several Directors including the Managing Director of Bell Lanka are also Directors of the Bell Group.

The Bell Group has appointed Bell Lanka as their Sole-Agent in Sri Lanka for the sale of "Bell" brand wine. According to the Sole-Agency Agreement Bell Lanka has to pay Bell Group 3% of retail price from the local sales of the "Bell" brand wine as Royalty.

Bell France is a high-quality wine manufacturer based in France. They also manufacture "Bell" brand wine according to the specifications and quality standards of the Bell Group and sell the same only to the buyers nominated by the Bell Group. A 63% of shares of Bell France are held by the Bell Group and several Directors of Bell France are also Directors of the Bell Group.

Bell Lanka has imported a shipment of 01x20' container said to contain 20,000 units of "Bell" brand wine from Bell France. The Ex-Work price agreed is Euro 3.75 per bottle.

Bell Lanka has entrusted the transportation of the said container from the warehouse of Bell France to the Port of Paris in France to a Freight Forwarding company namely Sea-Sky Ltd. They have issued an Invoice with the following charges.

1. Packing Material Cost - Euro 150
2. Inland Transport - Euro 925
3. Inland Handling Charges - Euro 125
4. Terminal Handling Charges (THC) at the Port of Paris - Euro 300

Sea-Sky Ltd has loaded the subject container to a vessel operated by Queen's Line on "Freight Collect" basis. On arrival of the container in Colombo the shipping agent of Queen's Line in Colombo has issued the Delivery Order on recovery of following charges.

1. Sea Freight - USD 1500
2. Bunker Adjustment Fee (BAF) - USD 150
3. Currency Adjustment Fee (CAF) - USD 100
4. Terminal Handling Charges at the Port of Colombo (THC) - USD 250
5. Container Deposit - Rs. 5750
6. Container Washing - Rs. 1150

The marine insurance has been obtained locally from Sri Lanka Insurance Company on payment of Rs. 17,250/= for the whole shipment.

After a careful cost calculation Bell Lanka has fixed the local retail price of a Bell brand wine bottle as Rs. 1,500/=.

Exchange rates are provided in the attached documents to this question paper.

(a) Calculate the amount payable as **Royalty** from the local sales proceeds for the subject shipment in **Euro**.

(b) Calculate the **Cost of Transport** of the subject shipment from the warehouse of Bell France to the Port of Colombo in **Euro**

(c) Calculate the **Customs Value** of the subject shipment in **Sri Lankan Rupees**

(20 Marks)

Question 02

Cocoa (Pvt) Ltd has imported a consignment of 10,000 kg "Cocoa Powder" from Malaysia. The price paid is CIF Colombo USD 1.4 per kg. According to the Sri Lanka Tariff Guide the Cocoa Powder containing added sugar or other sweetening matter is classified within HS Code 1806.10 and the following taxes are payable for the importation.

(A) Customs Duty - 30% or Rs. 115/= per kg
(B) VAT - 12%
(C) PAL - 5%
(D) NBT - 2%
(E) Cess - 35% or Rs. 60/= per kg
(F) Excise Duty - 30%

Calculate separately all six above mentioned taxes and the total payable for the above shipment in **Sri Lankan Rupees**.

Formula and exchange rates are provided in the attached documents to this question paper.

(20 Marks)

Question 03

(a) Explain the scope of the Convention on Harmonized Commodity Description and Coding System

(b) Explain the structuer of a HS Code upto 8 digit level and the proceedure one should follow to determin the HS Code of any given commodity

(20 Marks)

Question 04

Write an essay describing the structure, functions, objectives and the legal framework of the Sri Lanka Customs. (20 Marks)

Question 05

(a) Name the documents required to clear the imported goods through Customs.

(b) Explain in details the steps you should follow in clearing imported goods through Customs.

(20 marks)

Question 06

(a) Explain in breif the objectives and functions of World Trade Organisation (WTO)

(b) Explain in detial the six methods used to determin the Customs Value under WTO Valuation Agreement

(20 Marks)

Question 07

Select 04 topics from the following topics and write 04 short essays

(a) Customs Ordinance
(b) Imports and Exports (Control) Act
(c) Methods of payment in international trade
(d) Bill of Lading/ Airway Bill
(e) Non-Tariff Barriers
(f) General Agreement on Tariff and Trade (GATT)
(g) Section 10 of the Customs Ordinance of Sri Lanka

(20 Marks)

Question 08

(a) Describe the functions of the Sri Lanka Customs and legislative framework related to such functions. (10 Marks)

(b) Explain Section 12 of the Customs Ordinance including a detail explanation of the Schedule B (Table of Prohibitions and Restrictions). (10 Marks)

----------END OF THE QUESTION PAPER----------

Computation formulae for imported goods

Where

v	=	CIF value in Rupee
c	=	Cess levy under Sri Lanka Export Development Act
d	=	Customs Duty
e	=	Excise (Special Provisions) Duty (ED)
t	=	Value Added Tax (VAT)
n	=	Nation Building Tax
p	=	Port and Airport Development Levy (PAL)
r_e	=	Rate of Excise (Special Provisions) Duty (ED)
r_t	=	Rate of Value Added Tax (VAT)
r_n	=	Rate of Nation Building Tax

- Customs Duty (d) = (CIF value) × (Customs duty rate)
  or
  = (quantity) × (unit rate of customs duty)

- Value Added Tax (t) = (v + 10% of v + d + c + p + e) × r_t

- Cess Levy (c) = (v + 10% of v) × (Cess levy rate)
  or
  = (quantity) × (unit rate of Cess levy)

- Port and Airport Development Levy (p) = (CIF value) × (PAL rate)

- Excise (Special Provisions) Duty (e) = (v + 15% of v+ d + c + p) × r_e
  or
  = (quantity) × (unit rate of Excise Duty)

- Special Commodity Levy = (Quantity) × (unit rate of Special Commodity Levy)

- Nation Building Tax (n) = (v +10%v + d + c + p + e) r_n

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Schedule

Rates of Exchange Effective From 26.08.2019 to 01.09.2019

	Country	Country Code	Currency	Currency Code	Rate of Exchange (Rs.)
1	Australia	AU	Dollar	AUD	122.5013
2	Bahrain	BH	Dinar	BHD	480.7536
3	Bangladesh	BD	Taka	BDT	2.1472
4	Brazil	BR	Brazil Real	BRL	44.5388
5	Brunei	BN	Brunei Dollar	BND	130.7519
6	Canada	CA	Canadian Dollar	CAD	136.1082
7	China	CN	Renminbi	CNY	25.5432
8	China	CN	Offshore	CNH	25.5238
9	Czechoslovakia	CZ	Koruna	CZK	7.7845
10	Denmark	DK	Kroner	DKK	26.9204
11	Egypt	EG	Pound	EGP	10.9379
12	Euro Zone		Euro	EUR	200.7161
13	Ghana	GH	Cedi	GHS	33.2554
14	Hongkong	HK	Dollar	HKD	23.1213
15	Hungary	HU	Forint	HUF	0.6116
16	India	IN	Rupee	INR	2.5197
17	Indonesia	ID	Rupiah	IDR	0.0127
18	Iran	IR	Riyal	IRR	0.0043
19	Japan	JP	Yen	JPY	1.7013
20	Jordan	JO	Dinar	JOD	255.6300
21	Korea	KR	Won	KRW	0.1492
22	Kuwait	KW	Dinar	KWD	595.8958
23	Macau	MO	Pataca	MOP	22.4448
24	Malaysia	MY	Ringgit	MYR	43.2609
25	Maldives	MV	Rufiya	MVR	11.7233
26	Mauritius	MU	Rupee	MUR	5.0067
27	Myanmar	MM	Kyat	MMK	0.1192
28	Nepal	NP	Rupee	NPR	1.5773
29	New Zealand	NZ	Dollar	NZD	115.8316
30	Nigeria	NG	Naira	NGN	0.5914
31	Norway	NO	Kroner	NOK	20.1745
32	Oman	OM	Riyal	OMR	470.7515
33	Pakistan	PK	Rupee	PKR	1.1363
34	Papua New Guinea	PG	Kina	PGK	53.3757
35	Philippines	PH	Peso	PHP	3.4601
36	Poland	PL	Zloty	PLN	46.0407
37	Qatar	QA	Riyal	QAR	49.7780
38	Russia	RU	Rouble	RUB	2.7635
39	Saudi Arabia	SA	Riyal	SAR	48.3266
40	Seychelles	SC	Rupee	SCR	13.2584
41	Singapore	SG	Dollar	SGD	130.7519
42	South Africa	ZA	Rand	ZAR	11.8970
43	Sweden	SE	Krona	SEK	18.7291
44	Switzerland	CH	Francs	CHF	184.1045
45	Taiwan	TW	Dollar	TWD	5.7701
46	Thailand	TH	Baht	THB	5.8854
47	U.A.E.	AE	Dirham	AED	49.3423
48	United Kingdom	GB	Sterling Pound	GBP	221.7855
49	United States of America	US	Dollar	USD	181.2417
50	Zambia (Old)	ZM	Kwacha	ZMK	0.0349
51	Zambia (New)	ZM	Kwacha	ZMW	13.8247
52	Zimbabwe	ZW	Dollar	ZWD	0.4776

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SEMESTER END EXAMINATION

Airport Planning and Management – APMG0353

- This paper consists of EIGHT questions on THREE (03) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2019.08.31 Pass mark: 50% Time: 03 Hours

Question 01: (Compulsory)

(a) What are the services and facilities available in an airport for the passengers and aircraft (05 Marks)

(b) Explain what is a delay in an airport and three factors that contribute towards delay in an airport. (05 Marks)

(c) Explain what is airside and landside in an airport in detail. (05 Marks)

(d) Identify the types of airports/aerodromes in Sri Lanka with two examples each for the category. (05 Marks)

Question 02

What are the different airport ownership types. Name the different ownership types and discuss their characteristics. In your view what type of an ownership style is more suitable for the two international airports in Sri Lanka? (20 Marks)

Question 03

(a) There are different types of runways based on the markings that exist. These markings are decided based on the navigational aids that are available in the airport. Explain these different types of runways based on the markings with graphical illustrations. (15 Marks)

(b) Identify 5 different planning studies that are undertaken when planning airport infrastructure. (05 Marks)

Question 04

(a) Explain four types of airport terminal configurations with the use of appropriate graphical illustrations to support your answer. (10 Marks)

(b) Explain how pilots make use of PAPIs and VASIs when approaching to land in an airport. You may use graphical illustrations to support your answer. (10 Marks)

Question 05

(a) What is meant by FIR? List down three FIRs that are adjoining to the Colombo FIR. (05 Marks)

(b) Explain four components of airport master planning in brief. (10 Marks)

(c) What are safety inspection programmes in the context of an airport? Who conducts these safety inspections and what are the areas covered through these inspections in an aerodrome. (05 Marks)

Question 06

(a) Aviation is a system that is vulnerable to security threats with the changing environment of the industry. In this context security is one of the important aspects

that require careful implementation of means and methods to provide security at commercial airports? Explain four of these methods in detail. (10 Marks)

(b) Discuss the pros and cons of trusted traveler programme and computer assisted passenger -screening system. (10 marks)

Question 07

(a) Explain what are aeronautical and non-aeronautical revenue sources in the context of an airport. (05 Marks)

(b) List down four aeronautical and non-aeronautical income sources. (05 Marks)

(c) Airports play different roles other than its day-to-day operations that take place. Among these are the environmental role, economic role and the social role that an airport fulfills. Considering Bandaranaike International Airport explain its economic role in detail with examples. (10 Marks)

Question 08

(a) Similar to runway markings and lighting there are different types of signs that are installed in airfields in order to provide more precise and accurate information for pilots to navigate the aircraft in the airfield. These signs fall into different categories. Identify two main categories and two signs each for the categories identified by you with graphical illustration with correct color coding. (10 Marks)

(b) Explain two different types of navigational aids that are used by airport operators to provide more accurate information to pilots when navigating the aircraft.

(10 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Project Management – PMGT0364

- This paper consists of EIGHT questions on FOUR (04) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Formulae sheet is attached.

Date: 2019.09.10 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) Explain the difference between projects and operations. (04 Marks)

(b) What are the triple constraints for projects? (02 Marks)

(c) Explain how changes in one constraint will affect the other two constraints with an example. (06 Marks)

(d) Identify stages of project lifecycle and briefly explain each stage. (08 Marks)

Question 02

(a) Briefly explain three areas of feasibility when conducting a feasibility study for a project. (05 Marks)

(b) Project Alpha requires an initial investment of $200,000 and is expected to generate the following net cash inflows:

Table 1.00: Project Alpha, cash inflows

Year	Net cash inflow ($)
Year 1	100,000
Year 2	60,000
Year 3	50,000
Year 4	40,000

(i) Calculate the payback period for project Alpha. (03 Marks)

(ii) Calculate the Net Cash Flow for project Alpha considering that discount rate applicable for this project in 10%. (05 Marks)

(c) Discuss the mistakes that a project manager could make by not clearly understanding the organization strategy. (07 Marks)

Question 03

(a) Explain briefly why the project scope management is important to any project. (02 Marks)

(b) Describe the items in the project scope checklist that ensures the project scope is comprehensive. (12 Marks)

(c) Discuss three benefits that can be achieved by constructing a Work Breakdown Structure for a project. (06 Marks)

Question 04

(a) Mention a practical project related to transport and logistics industry and identify 8 stakeholders for that project. (04 Marks)

(d) Explain the differences in information needs and timing of information using at least two of the above stakeholders identified in Question 04 (a). (08 Marks)

(e) Explain why it is important to properly manage stakeholders for the success of projects. Relate to the project in Question 04 (a) when possible. (08 Marks)

Question 05

(a) List four influential factors to an estimate of a project and explain how any two could affect the estimate. (06 Marks)

(b) What are the two main approaches in estimating projects? Describe one technique used under each approach. (06 Marks)

(c) Describe four ways how you could increase the accuracy of estimates. (08 Marks)

Question 06

A project is specified by activities A, B, C, D, E, F and G. Following table 2.00 represents the nature of the relationships and relevant lags among these activities.

Table 2.00: Activity relationships.

Activity	Activity Duration	Relationship	Lag relationship
A	2	-	-
B	4	Start to Start A to B	2
C	4	Finish to Start A to C	-
D	6	Finish to Start B to D	-
		Finish to Start C to D	4
E	4	Finish to Start B to E	-
		Finish to Start D to E	-
F	8	Start to Start C to F	2
		Finish to Finish E to F	2
G	3	Finish to Start F to G	-

(a) Draw the network diagram to represent the project. (04 Marks)

(b) Calculate the Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF) and Slack (SL) for activities A, B, C, D, and F. (10 Marks)

(c) Identify the activities in the critical path. (02 Marks)

(d) What are the advantages of constructing a project network? (04 Marks)

Question 07

(a) Explain the four stages of risk management process. (10 Marks)

(b) Name four main risk response strategies and explain one strategy with an example. (06 Marks)

(c) Why do you think it is important to have contingency plans? (04 Marks)

Question 08

(a) List five things that are typically included in a project charter of a common project. (05 Marks)

(b) List four activities to be done during the closure phase of a project. (05 Marks)

(c) Explain why sometimes it is necessary to reduce the project duration and explain the ways by which acceleration of projects could be achieved. (10 Marks)

----------END OF THE QUESTION PAPER----------

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Formulae Sheet

1. **Payback**

A = Last year with a negative cumulative cash flow, B = Remaining value of negative cumulative cash flow at the end of the period A, C = Cash inflow during the period following period A.

$$\text{Payback} = A + \frac{B}{C}$$

2. **Present Value**

When i=*Discount rate* and n=*Year numbe.*

$$Present\,Value = \frac{Cash\,flow}{(1+i)^n}$$

3. Present Value table

Present value of \$1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

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Year 3 Semester II

SEMETSER END EXAMINATION

Port Planning – PLUT0250

- This paper consists of EIGHT questions on THREE (03) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2019.09.07 Pass mark: 50% Time: 03 Hours

Question –1(Compulsory)

Select **ONE** of the following and discuss the opportunities and threats that can have to Sri Lankan Ports with regard to future port & port facility planning?

(a) Indian Sagarmala concept
(b) Sethusamdram ship canal project
(c) Kra Canal project
(d) APSEZ – Adani Port Special Economic Zone port projects
(e) Myanmar ports development & container traffic

(20 Marks)

Question – 2

(a) What is the vision of the Sri Lanka Ports Authority? (1 Mark)
(b) What is the mission of the Sri Lanka Ports Authority? (1 Mark)
(c) What are the aspirations of the Sri Lanka Ports Authority? (4 Marks)
(d) What are the functions to achieve the strategies? (14 Marks)

Question –3

(a) Give examples of four fully Automated Container Terminals in the World? (4 Marks)
(b) List out fully automated container handling euipments that can be used for ship/quay transfer /storage/receipt delovery gate operations? (10 Marks)

(c) What are state of the art modern equipments that are used at CICT compared to JCT & SAGT (6 Marks)

Question – 4

List out current challenges faced by Port Operators & Terminal Operators? (20 Marks)

Question – 5

(a) Name Global/International Port & Terminal Operators? (5 Marks)

(b) Give three examples of Global/International Operators participation in Sri Lanka & shareholding in each facility? (6 Marks)

(c) Give five examples of Global/International Operators participation in Indian Ports? (5 Marks)

(d) Why Sri Lanka invited Global/International Operators to run port facilities on PPP/BOT basis? (4 Marks)

Question – 6

(a) What is the rationale behind building a new port in the south of Sri Lanka - Hambantota? (5 Marks)

(b) What are the current facilities available in the Port of Hambantota? (10 Marks)

(c) What kind of business that can be attracted and develop in the Port of Hambantota? (5 Marks)

Question – 7

(a) What is the rational behind expanding Colombo Harbour build by British & explain why? (5 Marks)

(b) What are the infrastructure and navigational facilities in Colombo South Harbour? (5 Marks)

(c) Explain exhisting & planned container terminal features in Colombo South Harbour? (5 Marks)

(d) What kind of equipment you propose to have in ECT & WCT in the future and give reasons? (5 Marks)

Question –8

(a) Name the four generations of Ship to Shore Gantry Crane?

(4 Marks)

(b) What are the four types of spreader attachement that can be fixed in to Ship to Shore Gantry cranes to discharge & load more container at once?

(4 Marks)

(c) Name different semi & fully automated quay tranfer equipments?

(6 Marks)

(d) Name different semi & fully automated storage/stacking equipments?

(6 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Production and Operations Management – POMG0368

- This paper consists of EIGHT questions on NINE (09) pages
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Formulae sheet is attached

Date: 2019.09.05 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) Logistics firm operations of last 7 weeks are shown in the table below. Predict the operations of 8th and 9th weeks by using appropriate forecasting technique.

(06 Marks)

Table 1:1 – Operations

Week	Operations
1	405
2	410
3	420
4	415
5	412
6	120

7	124

(b) A well-known transport agency wants to predict quarterly demand for periods 15 and 16. Use below information to predict the demand. The series consists of both trend and seasonality. (14 Marks)

Table 1:2 – Demand

Year	Quarter	Actual Demand
1	1	132
2	2	140
3	3	146
4	4	153
5	1	160
6	2	168
7	3	176
8	4	185

Question 02

(a) Prepare a forecast using each of below approaches:

Table 2:1 – Seasonal Relatives

Month	Number of orders
Jan	60
Feb	65
Mar	55
Apr	58
May	64

(i) The appropriate naïve approach (02 Marks)

(ii) A four-period moving average (02 Marks)

(iii) A weighted average using weights of 0.5, 0.3 and 0.2 (02 Marks)

(iv) Exponential smoothing with a smoothing constant of 0.4 (02 Marks)

(b) A cosmetics supplier's marketing department has developed a linear trend equation that can be used to predict annual sales of its popular Hand and Foot Cream.

$F_t = 80 + 15t$

Where

F_t = Annual sales (000 bottles)

t = 0 corresponds to 2010

(i) Are annual sales increasing or decreasing? By how much? (02 Marks)

(ii) Predict annual sales for the 2026 using the equation. (04 Marks)

(c) An ABC transporter's records during the last five weeks indicate the number of job requests:

Table 2:2 - Jobs

Week	1	2	3	4	5
Requests	20	22	18	21	22

Predict the number of requests for week 6 using each of these methods:

(i) A three-period moving average (02 Marks)

(ii) Exponential smoothing with $\alpha = 0.3$. Use 20 for week 2 forecast. (04 Marks)

Question 03

(a) Define the term "Operations Management". (02 Marks)

(b) Briefly explain the Business Operations overlap. (06 Marks)

(c) Briefly explain the transformation process of an organization. (06 Marks)

(d) Briefly explain the "Value-Added" in Operations Management. (06 Marks)

Question 04

(a) Identify two types of researches in Operations Management. (03 Marks)

(b) Identify five reasons for product and service design. (05 Marks)

(c) Briefly explain two trends in product and service design. (06 Marks)

(d) Briefly explain two sources of ideas for product and service design. (06 Marks)

Question 05

Twelve tasks, with times and precedence requirements as shown in the following table, are to be assigned to workstations using a cycle time of 1.2 minutes. Two heuristic rules will be tried:

1) Greatest positional weight, and 2) greatest number of following tasks.
   In each case, the tiebreaker will be shortest task time.

Task	Length (minutes)	Follows Task
a	0.1	–
b	0.2	a
c	0.9	b
d	0.6	c
e	0.1	–
f	0.2	d, e
g	0.4	f
h	0.1	g
i	0.2	h
j	0.7	i
k	0.3	j
l	0.2	k

(a) Draw the precedence diagram for this line. (02 Marks)

(b) Assign tasks to stations under each of the two rules. (15 Marks)

(c) Compute the percentage of idle time for each rule. (03 Marks)

Question 06

(a) A manager is trying to decide whether to purchase a certain part or to have it produced internally. Internal production could use either of two processes. One would entail a variable cost of $ 17 per unit and an annual fixed cost of $200,000; the other would entail a variable cost of $14 per unit and an annual fixed cost of $240,000. Three vendors are willing to provide the part. Vendor "A" has a price of $20 per unit for any voulme up to 30,000 units. Vendor "B" has a price of $22 per unit for demand of 1,000 units or less, and $18 per unit for larger quantities. Vendor "C" offers a price of $21 per unit for the first 1,000 units, and $19 per unit for additional units.

If the manager anticipates an annual volume of 10,000 units, which alternative would be best from a cost standpoint? For 20,000 units, which alternative would be best? (08 Marks)

(b) The owner of logistics firm, is contemplating adding a new project, which will require leasing a new vehicle for a monthly payment of $6000. Variable costs would be $2.00 per each contarct, and they earn $7.00 from each .

(i) How many contracts must have in order to break even? (02 Marks)

(ii) What would the profit (loss) be for 1,000 contracts in a month? (02 Marks)

(iii) How many contracts must have to realize a profit of $4,000? (04 Marks)

(iv) For 2,000 contracts, and a profit target of $5,000, what price should be charged per contract? (04 Marks)

Question 07

Now juice, Inc., produces bottled pickle juice. A planner has developed an aggregate forecast for demand (in cases) for the next six months.

Month	May	Jun	Jul	Aug	Sep	Oct
Forecast	4000	4800	5600	7200	6400	5000

Use the following information to develop aggregate plans

Regular Production cost	Rs. 10 per case
Regular Production capacity	5, 000 cases
Overtime Production cost	Rs. 16 per case
Subcontracting cost	Rs. 20 per case
Holding cost	Rs. 10 per case per month
Beginning Inventory	0 units

Develop an aggregate plan using a combination of overtime (500 cases per period maximum), inventory, and subcontracting (500 cases per period maximum) to handle variations in demand. (20 Marks)

Question 08

(a) Define the term "Work Measurement" in Operations Management. (05 Marks)

(b) Time study of a work operation yielded an average observed time of 0.23 minutes. The analyst rated the observed worker at 95%. The firm uses a 7% allowance factor. Compute the standard time. (06 Marks)

(c) The data in the table below represent time study observations for a woodworking operation. Based on the observations, determine the standard time for the operation, assuming an allowance of 6 percent of job time.

Table 8.1 – Element Time Observations

Element	Performance Rating	Observations (Minutes per Cycle)					
		1	2	3	4	5	6
1	75%	0.10	0.12	0.15	0.11	0.11	0.16
2	80%	2.47	2.16	2.15	2.25	2.01	2.16
3	85%	1.21	1.25	1.22	5.92	1.61	1.62

(09 Marks)

----------*END OF THE QUESTION PAPER*----------

Formula Sheet

Simple Moving Average

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots + D_{t-n+1}}{n}$$

D_t : actual demand in period t

n : number of periods in the average

1. **Weighted Moving Average**

$$T_{t+1} = W_1D_1 + W_2D_{t-1} + \ldots + W_nD_{t-n+1}$$

2. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant ($0 \leq \alpha \geq 1$)

4. **Trend Projections**

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2} \qquad a = \bar{y} - b\bar{x}$$

5. **Exponential Smoothing with Trend Adjustment**

$$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$$

$$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$$

$$FIT_t = F_t + T_t$$

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Year 3 Semester II

SEMESTER END EXAMINATION

Operational Research – ORSH0372

- This paper consists of TWO parts on THIRTEEN (13) pages
- PART A is compulsory
- Answer THREE (03) questions from Part B
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2019.09.03 Pass mark: 50% Time: 03 Hours

PART A (Compulsory)

Question 01

Use MCQ answer sheet to answer following questions with one correct answer.

1. Unboundedness is usually a sign that the LP problem

(A) has finite multiple solutions

(B) is degenerate.

(C) contains too many redundant constraints.

(D) has been formulated improperly.

2. The objective functions and constraints are linear relationships between .....

(A) variables

(B) constraints

(C) Functions

(D) All of the above

3. In order for a linear programming problem to have a unique solution, the solution must exist .....

(A) at the intersection of the nonnegativity constraints.

(B) at the intersection of two or more constraints.

(C) at the intersection of a nonnegativity constraint and a resource constraint.

(D) at the intersection of the objective function and a constraint.

4. LP theory states that the optimal solution to any problem will lie at.....

(A) the origin.

(B) the highest point of the feasible region.

(C) a corner point of the feasible region.

(D) the lowest point in the feasible region.

5. The first step in formulating an LP problem is

(A) graph the problem.

(B) identify the objective and the constraints.

(C) define the decision variables.

(D) understand the managerial problem being faced.

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6. What is the cost of the transportation solution shown in the table?

	W	X	Y	Supply
A	$3 20	$5 50	$9 0	70
B	$5 0	$4 30	$7 0	30
C	$10 40	$8 0	$3 80	120
Demand	60	80	80	220

(A) $1350

(B) $1070

(C) $1230

(D) $1150

7. An initial transportation solution appears in the table given below.

	C	D	Factory Capacity
A	10	0	10
B	15	25	40
Warehouse Demand	25	25	50

Can this solution be improved if it costs $5 per unit to ship from A to C; $7 per unit to ship from A to D; $8 to ship from B to C; and $9 to ship from B to D?

(A) Yes, the initial solution can be improved by $10.

(B) No, this solution is optimal.

(C) Yes, this solution can be improved by $50.

(D) Yes, this solution can be improved by $100.

8. The transportation method assumes that .....

(A) there are no economies of scale if large quantities are shipped from one source to one destination.

(B) the number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns in the table plus 1

(C) there is only one optimal solution for each problem.

(D) the number of dummy sources equals the number of dummy destinations.

9. Which of the following is a method for improving an initial solution in a transportation problem?

(A) Least Cost

(B) northwest-corner

(C) Method of Multipliers

(D) Vougel's Approximation Method

10. The purpose of a dummy source or dummy destination in a transportation problem is to

(A) prevent the solution from becoming degenerate.

(B) make certain that the total cost does not exceed some specified figure.

(C) provide a means of representing a dummy problem.

(D) obtain a balance between total supply and total demand.

11. With the transportation technique, the initial solution can be generated in any fashion one chooses. The only restriction is that

(A) the solution is not degenerate.

(B) the edge constraints for supply and demand are satisfied.

(C) one must use the northwest-corner method.

(D) the solution must be optimal.

12. The purpose of the method of Multipliers is to

(A) assist one in moving from an initial feasible solution to the optimal solution.

(B) determine whether a given solution is feasible or not

(C) identify the relevant costs in a transportation problem.

(D) develop the initial solution to the transportation problem.

13. if the feasible region of a LP model is empty, the solution is,

(A) infeasible

(B) unbounded

(C) alternative

(D) degeneracy

14. if the re are 'm' original variables and 'n' introduced variables, then there will be ..... columns in the simplex table

(A) m+n-3

(B) m+n +3

(C) m-n

(D) m+n-1

15. If in a LP model, the solution of a variable can be made infinitely large without violating the constraints, the solution is

(A) infeasible

(B) alternative

(C) unbounded

(D) degeneracy

16. In 2-phase method, we add ..... variables in the case of '='

(A) artificial variables

(B) slack variables

(C) surplus variables

(D) all of the above

17. Which of the following statement is true with respect to the optimal solution of an LP problem

(A) every LP problem has an optimal solution

(B) optimal solution of an LP model always occurs at extreme point

(C) at optimal solution, all resources are fully utilized.

(D) if an optimal solution exists, there will always be at least one at a corner

18. While plotting constraints on a graph paper, terminal points on both axes are connected by a straight line because .....

(A) the resources are limited in supply

(B) the objective function as a linear function

(C) the constraints are linear equations or inequalities

(D) all of the above

19. alternative solution exists when .....
    (A) one constraint is redundant
    (B) objective function is parallel to binding constraint
    (C) two constraints are parallel
    (D) all of the above

20. ..... assumption means the prior knowledge of all the coefficients in the objective function, the coefficients of the constraints and the resource values.
    (A) proportionality
    (B) certainty
    (C) additivity
    (D) divisibility

(20 marks)

Question 02 (Compulsory)

A leading charted accountant is attempting to determine the best investment portfolio and is considering six alternative investment proposals. The following table indicates point estimates for the price per share, the annual growth rate in the price per share, the annual dividend per share and a measure of the risk associated with each investment. Table 2.01 gives the portfolio data.

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Table 2.01

Shares under the consideration	Investment alternatives					
	A	B	C	D	E	F
Current price per share LKR	80.00	100.00	160.00	120.00	150.00	200.00
Projected annual growth rate	0.08	0.07	0.01	0.12	0.09	0.15
Projected annual dividend per share LKR	4.00	4.50	7.50	5.50	5.75	0.00
Projected risk return	0.05	0.03	0.10	0.20	0.06	0.08

- The total amount available for investment is LKR 1,250,000.00 and the following conditions are required to be satisfied.
- The maximum rupee amount to be invested in alternative 'F" is LKR 250,000.00.
- No more than LKR 500,000 should be invested in alternative A and B combined.
- Total weighted risk should not be greater than 0.10.
- $Total\ weighted\ risk = \frac{(amount\ invested\ in\ alternative\ i)*(risk\ of\ alternative\ i)}{(total\ amount\ invested\ in\ all\ the\ alternatives}$
- For the sake of diversity, at least 100 shares of each stock should be purchased.
- At least 10% of the total investment should be in alternatives A and B combined.
- Dividends for the year should be at least LKR 10,000.00.
- Rupee return per share of stock = current price per share + dividend per share
- If the objective is to maximise total rupee return, formulate this problem as an LP model.

- Assume that the time horizon for the investment is one year.

(20 Marks)

PART B – Answer THREE (03) questions ONLY

Question 03

A manufacturer of packing materials manufactures two different types of packing tins; type A and type B. Major production facilities involved are cutting and joining. The cutting department can process 300 type A tins or 500 type B tins per hour. The joining department can process 500 type A tins or 300 type B tins per hour. If the contribution towards profit for type A tin is the same as that of a type B tin (USD 1),

Find the optimum production level using graphical method. (20 Marks)

Question 04

Use simplex method to solve the following LP problem.

Max $Z = 3X_1 + 5X_2 + 4X_3$

Subject to the constraints

$2X_1 + 3X_2 \leq 8$

$2X_2 + 5X_3 \leq 10$

$3X_1 + 2X_2 + 4X_3 \leq 15$

$X1, X2, X3 \geq 0$

Question 05

Consider the LP model given below;

Minimize Z = 10 X1 + 20 X2

Subject to

3 X1 + 2 X2 ≥ 18

X1 + 3 X2 ≥ 8

2 X1 + X2 ≥ 6

X1, X2 ≥ 0

(a) Construct the dual problem, for this primal problem. (05 Marks)

(b) Solve the primal problem using any appropriate method. (15 Marks)

Question 06

Consider the LP model given below.

Minimize Z = 40 X1 + 24 X2

Subject to

20 X1 + 50 X2 ≥ 4800

80 X1 + 50 X2 ≥ 7200

X1, X2 ≥ 0

Use 2 phase method and solve the following Linear Programming Problem by clearly stating the phase I objective function. (20 Marks)

Question 07

Melwa steel company is concerned with the problem of distributing imported ore from three ports (Colombo, Hambanthota and Galle) to four steel mills. The supplies of ore arriving at the ports are

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Table 6.01

Port Name	Supply Tonnes per week
Port of Colombo	20,000
Port of Hambanthota	38,000
Port of Galle	16,000

The demand at four steel mills are as follows

Table 6.02

Steel Mill	Demand Tonnes per week
A	10,000
B	18,000
C	22,000
D	24,000

The transportation cost is USD 0.5 per tonne per kilometre. The distance between the ports and the steel mills is as given below.

Table 6.03

	A	B	C	D
Port of Colombo	50	60	100	50
Port of Hambanthota	80	40	70	50
Port of Galle	90	70	30	50

(a) Find the initial transportation schedule using North West Corner method (05 Marks)

(b) Find the optimal transportation schedule (15 Marks)

Question 08

CASE I

Mr. Seneviratne is a system administrator of leading company, responsible for training non-IT staff members individually of the company for new software platform. As the IT literacy of staff memebers are different, training requirement of the staff members are also different. He schedules all his training sessions for 30-minutes. Some of the staff members take more or less than 30 minutes depending on the type of training requested. The following summary shows the various categories of training, their probabilities and the time actually needed to complete the training.

Table 7.01

CATEGORY OF TRAINING	TIME REQUIRED	PROBABILITY OF THE CATEGORY
Backup emails	45 minutes	0.40
Monthly backup of SAP system	60 minutes	0.15
Web browsing and email basics	15 minutes	0.15
OS installation	45 minutes	0.10
Troubleshooting	15 minutes	0.20

Simulate the training session of Mr. Seneviratne for **FOUR** hours and determine average waiting time for the staff members as well as the idleness of the trainer Mr. Seneviratne.

Assume that all staff members show up at the IT department at exactly their scheduled arrival time starting at 8.00 am. Use below random numbers for simulation run.

40 82 11 34 25 66 17 79

CASE II

Mr. Seneviratne is planning to recruite a trainee IT assistant on contract basis to reduce the waiting time of his staff members. But this Trainee is performing

- Web browsing and email basics
- Troubleshooting
- OS installations ONLY

Anyway if both of the trainees available, staffmembers are preffered Mr. Seneviratne, as he is more experianced person.

Simulate training sessions again for FOUR hours, and compare the average waiting time of patients in both cases.

What are recommendations that you suggest to Mr. Seneviratne in recruiting trainee person according to the results of your simulation?

(20 Marks)

---------- END OF THE QUESTION PAPER ----------

00030

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Year 3 Semester II
SEMESTER END EXAMINATION
Operational Research – ORSH0372
MCQ Answer Sheet

- Cross (×) the relavant box according to your answer

Date: 2019.09.03 Pass mark: 50% Time: 03 Hours

Question 01

1.	A	B	C	D	11.	A	B	C	D
2.	A	B	C	D	12.	A	B	C	D
3.	A	B	C	D	13.	A	B	C	D
4.	A	B	C	D	14.	A	B	C	D
5.	A	B	C	D	15.	A	B	C	D
6.	A	B	C	D	16.	A	B	C	D
7.	A	B	C	D	17.	A	B	C	D
8.	A	B	C	D	18.	A	B	C	D
9.	A	B	C	D	19.	A	B	C	D
10.	A	B	C	D	20.	A	B	C	D

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Year 3 Semester II

SEMESTER END EXAMINATION

Econometrics – ECON0321

- This paper consists of EIGHT questions on EIGHT (08) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Required supporting documents are attached to the question paper.

Date: 2019.08.29 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Select the correct answer and write that number in your answer script.

(a) The Numerical value of the statistics used to estimate a parameter is called

i. Estimator ii. Estimate iii. Confidence

iv. Statistics

(b) The standard deviation of a Sample distribution is called.

i. Population standard deviation ii. Estimator

iii. Standard error iv. Parameter

(c) Which one is said by Central Limit Theorem?

i. Mean of the samples is equal to the population mean.

ii. Mean of the sample means is equal to the population mean

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iii. Any sample mean is equal to the population mean

iv. None of the above

(d) The numbers of values that are free to vary after restrictions have been placed on data.

i. Estimate ii. Estimator iii. Degree of freedom iv. Statistic

(e) The assumed value of the population parameter is called

i. Estimator ii. Parameter iii. Expected estimate iv. Statistics

(f) If a hypothesis consists of many values that is called

i. Alternative hypothesis ii. Null hypothesis

iii. Simple hypothesis iv. Composite hypothesis

(g) Acceptance and Rejection regions are separated from

i. Significant levels ii. Critical points iii. Confidence coefficient

iv. Estimators

(h) Management of a company says that the weight of a product is 60kg in average. Which test is appropriate to test this statement?

i. Independent sample t test ii. Paired sample t test

iii. One sample t test iv. One way ANOVA

(i) Management of a company says that no difference between two products issued to the local market. Which test is appropriate to test this statement?

i. Independent sample t test ii. Paired sample t test

iii. One sample t test iv. One way ANOVA

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(j) Coefficient of determination in the regression model $Y=\beta_0+\beta_1X_1+\beta_2X_2$ is 0.65. Size of the sample is 10. What is the Adjusted coefficient of determination.

i. 0.45 ii. 0.55 iii. 0.64 iv. 0.71

(02×10 = 20 Marks)

Question 02

"Econometrics is the amalgam of Economics, Mathematics and Statistics".

(a) Briefly describe the above statement.

(06 Marks)

(b) Describe the traditional econometric methodology with an example

(08 Marks)

(c) Briefly describe the theoretical econometrics and applied econometrics?

(06 Marks)

Question 03

(a) What are the assumptions of Classical Linear Regression Model (CLRM)?

(08 Marks)

(b) Briefly describe the Law of Statistical Regularity.

(06 Marks)

(c) Why stationary data are important in time series models?

(06 Marks)

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Question 04

(a) "ABC" company is manufacturing electric car to the local and international market. Management of the company says that an electric car can travel 150km per fully charge. Selecting 12 electric cars, traveling distance has been estimated and information is provided in the table.

155	149	145	158	145	151	139	142	154	148	153	147

i. Test the statement of the management.

(06 Marks)

ii. Estimate the confidence interval of the difference.

(02 Marks)

(b) Two types of cranes are used in a fort to handle shipping containers. Management of the fort says that there is no difference in the containers handling between the two types of cranes. Following table provides information about the number of cranes handled by each crane during the last 15 days. Test and interpret the results.

Crane 1	40	43	41	39	38	43	37	39	39	40	43	39	38	44	40
Crane 2	44	35	39	41	37	39	40	47	41	36	40	41	38	67	41

(12 Marks)

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Question 05

(a) A company says that there are three types of vehicles which do not have any difference in fuel consumption. Selecting five vehicles from each type, number of kilometers per liter has been estimated and information is provided in the following table. You need to test the statement of the company by applying one way ANOVA at 5% level of significance.

Type 1	Type 2	Type 3
12	10	10
10	12	08
15	11	12
14	16	07
19	11	13

(10 Marks)

(b) "ABC" country introduced a regulation system for import restriction. Management of eight private companies says that this does not have an effect on their imports. The number of items imported during the pre and post periods is provided below. Test whether there is a significant effect from the regulation system on imports. Use 5% significance level.

Company	1	2	3	4	5	6	7	8
Pre-regulation imports (Rs.Million)	56	61	55	57	58	58	54	62
Post-regulation imports (Rs. Million)	47	51	48	58	45	60	47	54

(10 Marks)

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Question 06

Management of a company is expecting to construct a model to forecast the effect of advertising expenditure on export income. Table below provides information for a period of six years.

Years	Advertising expenditure (Rs. Million)	Export Income (Rs. Million)
2010	5	40
2011	6	50
2012	7	50
2013	7	70
2014	8	80
2015	9	70

(a) Construct Regression Model, ANOVA table and interpret the results.

(10 Marks)

(b) Calculate R-square, Adjusted R-square and take the decision.

(05 Marks)

(c) It is expected to determine the normality of residuals in the regression model. Coefficients of Skewness and Kurtosis for residuals are 0.353 and -1.791 respectively. Calculate Jarque-Bera test statistics and take the decision.

(05 Marks)

Question 07

(a) You need to test the statonarity of Money Supply (MS) using Augmented Dickey Fuller (ADF) unit root test. Write the model for random walk with drift and trend including one period lag to solve serial correlation.

(08 Marks)

(b) Briefly describe Restricted and Unrestricted VAR in econometrics studies?

(04 Marks)

(c) Interpret the following Augmented Dickey Fuller unit root test results.

Variables	Probability at level	Probability at first difference
GDP	0.4015	0.001
Money Supply (MS)	0.4823	0.000
External Debt (ED)	0.3215	0.000

(03 Marks)

(d) Selecting one period lag length and two co-integration equations, Vector Auto Regressive Model (VECM) has been constructed below. Interpret the VECM results.

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Dependent Variable: D(GDP)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.010	0.002	-5.221	0.030
C(2)	0.246	0.188	1.304	0.202
C(3)	0.173	0.133	1.300	0.203
C(4)	0.114	0.123	0.929	0.360
C(5)	0.062	0.039	1.551	0.131

R-squared	0.159	Mean dependent var	0.141
Adjusted R-squared	0.043	S.D. dependent var	0.051
S.E. of regression	0.050	Akaike info criterion	-2.999
Sum squared resid	0.0737	Schwarz criterion	-2.775
Log likelihood	55.997	Hannan-Quinn criter.	-2.923
F-statistic	1.3780	Durbin-Watson stat	1.912
Prob(F-statistic)	0.265		

(05 Marks)

Question 08

Write short notes on followings.

(a) Serial correlation

(b) Durbin-Watson test

(c) CUSUM test

(d) Spurious Models

(e) Heteroscedasticity

(20 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Customs and Commodity Inspections Operations – CCIO0234

- This paper consists of EIGHT questions on FIVE (05) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Required supporting documents are attached to the question paper.

Date: 2019.08.27 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Ms. Crust Lanka (Pvt) Ltd is a limited liability company registered under the companies Act of Sri Lanka. "Crust" is a popular biscuit manufactured by Ms. Crust Lanka (Pvt) Ltd according to a secret recipe comprising several herbs. Ms. Crust Lanka (Pvt) Ltd contracted a company namely Ms. Can Print (Bhd) Ltd in Malaysia for printing the biscuit wrappers. According to the contract signed between two companies Ms. Crust Lanka (Pvt) Ltd has to supply the moulds required to print the biscuit wrappers to Ms. Can Print (Bhd) Ltd free of charge. The two parties have agreed an Ex Works price of USD 0.12 per packet containing 100 wrappers and to supply the same in cartons containing 144 packets per carton.

Meantime Ms. Crust Lanka (Pvt) Ltd also signed an agreement with Ms. Best Moulds (Gmb) Ltd in Germany to make moulds using the artwork supplied by Ms. Crust Lanka (Pvt) Ltd and to ship them to Ms. Can Print (Bhd) Ltd. The CIF (Kuala Lumpur) Price agreed was USD 12,640 per mould. Ms. Best Moulds (Gmb) Ltd has recommended that a

mould should be used to print 1,000,000 wrappers only to maintain the expected printing quality. Accordingly, Ms. Best Moulds (Gmb) Ltd exported 10 units of moulds to Ms. Can Print (Bhd) Ltd. Total import clearance cost of this shipment incurred by Ms. Can Print (Bhd) Ltd was USD 3,160. This amount has been reimbursed by Ms. Crust Lanka (Pvt) Ltd to Ms. Can Print (Bhd) Ltd by a Telegraphic Transfer (TT) through Sampath Bank PLC.

As the first shipment Ms. Crust Lanka (Pvt) Ltd has imported a shipment of 01x20' container said to contain 540 cartons of Printed Biscuit Wrappers from Ms. Can Print (Bhd) Ltd.

Ms. Crust Lanka (Pvt) Ltd has entrusted the transportation of the said container from Malaysia to the Port of Colombo to a Freight Forwarding company namely Sea-Sky Lanka Ltd. They have issued a quotation containing the following charges.

Charges at Origin

1. Sea Freight - USD 1285
2. Loading Charges - USD 315
3. Inland Transport- USD 725
4. Handling Charges - USD 165

Charges at Destination

1. Terminal Handling (THC) - USD 250
2. Container Deposit - Rs. 5750
3. Container Washing - Rs. 1150

In addition to the above charges the Sea-Sky Lanka Ltd has also charged USD 150 as Bunker Adjustment Fee (BAF) and USD 110 as Currency Adjustment Fee (CAF) on the arrival of the container.

The marine insurance has been obtained locally from Sri Lanka Insurance Company on payment of Rs. 14,589/= for the whole shipment.

The Commercial Invoice submitted to Sri Lanka Customs for the clearance of the said shipment indicated CIF price as USD 10,716. The Customs Officers rejected this value and move to calculate the correct CIF value. Presume that you are the Customs Officer who was entrusted with this task and calculate the Customs Value of the subject shipment in Sri Lankan Rupees. The Exchange Rate is Rs. 145.8899 per US Dollar.

(20 Marks)

Question 02

Name the six methods given in the WTO Valuation Agreement to determine the Customs Value and explain in detail the Article 1 (First Method) and the Article 8 (Adjustments) of the Schedule E to the Customs Ordinance. (20 Marks)

Question 03

(a) Describe the functions of the Sri Lanka Customs and legislative framework related to such functions. (10 Marks)

(b) Explain Section 12 of the Customs Ordinance including a detail explanation of the Schedule B (Table of Prohibitions and Restrictions). (10 Marks)

Question 04

Select only TWO (02) from the following topics and write detail essays (20 Marks)

(a) Special Import Licence and Payment Regulations

(b) World Customs Organisation (WCO)

(c) World Trade Organization (WTO)

(d) India Sri Lanka Free Trade Agreement

(e) Asia Pacific Trade Agreement

Question 05

Explain in the structuer of a HS Code upto 6 digits and the proceedure one should follow to determin the HS Code of any given commodity (20 Marks)

Question 06

(a) Elaborate on the General Agreement on Tariff and Trade (GATT) and the trasformation of GATT to World Trade Organisation (WTO) (10 Marks)

(b) Name the six methods used in the WTO Valuation Agreement to determine the Customs Value and explain in detial the first method (10 Marks)

Question 07

Excel (Pvt) Ltd has imported a consignment of 15 units of Brand New Refrigerator-Freezers from Malaysia. The price paid is CIF Colombo USD 525 per unit. According to the Sri Lanka Tariff Guide 2014 the Combined Refrigerator-Freezers, fitted with separate external doors (unused) is classified within HS Code 8418.10.90 and the following taxes are payable for the importation.

Customs Duty	- 15%
VAT	- 12%
PAL	- 5%
NBT	- 2%
Cess	- 15%
Excise (SP) Duty	- 17%

Calculate all six taxes payable for the above shipment. Exchange Rate is Rs. 135 per US Dollar. Formulas are provided in the attached document to this question paper

(20 Marks)

Question 08

Write short essays on the following topics (20 Marks)

(a) Imports and Exports (Control) Act

(b) Exchange Control Act

(c) Protection of Government Revenue Act

(d) Intellectual Property Right Act

----------END OF THE QUESTION PAPER----------

00018

Schedule

Rates of Exchange Effective From 11.09.2017 to 17.09.2017

	Country	Country Code	Currency	Currency Code	Rate of Exchange (Rs.)
1	Australia	AU	Dollar	AUD	124.9371
2	Bahrain	BH	Dinar	BHD	409.7639
3	Bangladesh	BD	Taka	BDT	1.8937
4	Brazil	BR	Brazil Real	BRL	49.8572
5	Brunei	BN	Brunei Dollar	BND	115.4685
6	Canada	CA	Canadian Dollar	CAD	127.8186
7	China	CN	Renminbi	CNY	23.9034
8	China	CN	Offshore	CNH	23.8910
9	Czechoslovakia	CZ	Koruna	CZK	7.1253
10	Denmark	DK	Kroner	DKK	25.0220
11	Egypt	EG	Pound	EGP	8.7596
12	Euro Zone		Euro	EUR	186.1810
13	Ghana	GH	Cedi	GHS	34.8803
14	Hongkong	HK	Dollar	HKD	19.8071
15	Hungary	HU	Forint	HUF	0.6087
16	India	IN	Rupee	INR	2.4138
17	Indonesia	ID	Rupiah	IDR	0.0116
18	Iran	IR	Riyal	IRR	0.0046
19	Japan	JP	Yen	JPY	1.4276
20	Jordan	JO	Dinar	JOD	217.9406
21	Korea	KR	Won	KRW	0.1369
22	Kuwait	KW	Dinar	KWD	512.5973
23	Macau	MO	Pataca	MOP	19.1688
24	Malaysia	MY	Ringgit	MYR	36.9223
25	Maldives	MV	Rufiya	MVR	9.9434
26	Mauritius	MU	Rupee	MUR	4.6612
27	Myanmar	MM	Kyat	MMK	0.1137
28	Nepal	NP	Rupee	NPR	1.5078
29	New Zealand	NZ	Dollar	NZD	112.6450
30	Nigeria	NG	Naira	NGN	0.5062
31	Norway	NO	Kroner	NOK	20.0173
32	Oman	OM	Riyal	OMR	401.3660
33	Pakistan	PK	Rupee	PKR	1.4667
34	Papua New Guinea	PG	Kina	PGK	48.2875
35	Philippines	PH	Peso	PHP	3.0464
36	Poland	PL	Zloty	PLN	43.7926
37	Qatar	QA	Riyal	QAR	41.7909
38	Russia	RU	Rouble	RUB	2.7135
39	Saudi Arabia	SA	Riyal	SAR	41.2031
40	Seychelles	SC	Rupee	SCR	11.4906
41	Singapore	SG	Dollar	SGD	115.4469
42	South Africa	ZA	Rand	ZAR	12.0759
43	Sweden	SE	Krona	SEK	19.5315
44	Switzerland	CH	Francs	CHF	163.3403
45	Taiwan	TW	Dollar	TWD	5.1596
46	Thailand	TH	Baht	THB	4.6725
47	U.A.E.	AE	Dirham	AED	42.0691
48	United Kingdom	GB	Sterling Pound	GBP	202.8074
49	United States of America	US	Dollar	USD	154.5199
50	Zambia (Old)	ZM	Kwacha	ZMK	0.0297
51	Zambia (New)	ZM	Kwacha	ZMW	16.9048
52	Zimbabwe	ZW	Dollar	ZWD	0.4072

Computation formulae for imported goods

Where

v	=	CIF value in Rupee
c	=	Cess levy under Sri Lanka Export Development Act
d	=	Customs Duty
e	=	Excise (Special Provisions) Duty (ED)
t	=	Value Added Tax (VAT)
n	=	Nation Building Tax
p	=	Port and Airport Development Levy (PAL)
r_e	=	Rate of Excise (Special Provisions) Duty (ED)
r_t	=	Rate of Value Added Tax (VAT)
r_n	=	Rate of Nation Building Tax

- Customs Duty (d) = (CIF value) × (Customs duty rate)
  or
  = (quantity) × (unit rate of customs duty)

- Value Added Tax (t) = (v + 10% of v + d + c + p + e) × r_t

- Cess Levy (c) = (v + 10% of v) × (Cess levy rate)
  or
  = (quantity) × (unit rate of Cess levy)

- Port and Airport Development Levy (p) = (CIF value) × (PAL rate)

- Excise (Special Provisions) Duty (e) = (v + 15% of v+ d + c + p) × r_e
  or
  = (quantity) × (unit rate of Excise Duty)

- Special Commodity Levy = (Quantity) × (unit rate of Special Commodity Levy)

- Nation Building Tax (n) = (v +10%v + d + c + p + e) r_n

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02

Year 3 Semester II

REPEAT EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT questions on SEVEN (07) pages
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2019.01.13 Pass mark: 50% Time: 03 Hours

Question 01

Mr. Perera - production manager of a manufacturing plant is attempting to devise a shift pattern for his employees. Each day of every working week is divided into three eight-hour shift periods as given below.

Shift No	Name of the shift	Time duration of the shift
1	Night Shift	00:01 – 08:00
2	Day Shift	08:01 – 16:00
3	Late Shift	16:01 – 24:00

The plant must be manned at all times and the minimum number of workers required for each of these shifts over any working week is as below:

Shift	Days of the week						
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Night	5	3	2	4	3	2	2
Day	7	8	9	5	7	2	5
Late	9	10	10	7	11	2	2

The union agreement governing acceptable shifts for workers is as follows:

Each worker is assigned to work either a night shift or a day shift or a late shift and once a worker has been assigned to a shift they must remain on the same shift every day that they work.

Each worker works four consecutive days during any seven-day period.

In total, there are currently 60 workers.

Formulate the Mr. Perera's problem as a linear program. (20 Marks)

Question 02

Solve the following LP model using graphical model

Maximize $Z = 100 X_1 + 100 X_2$

Subject to the constraints

$10 X_1 + 5 X_2 \leq 80$

$6 X_1 + 6 X_2 \leq 66$

$4X_1 + 8 X_2 \geq 24$

$5 X_1 + 6 X_2 \leq 90$

$X_1, X_2 \geq 0$

(20 Marks)

Question 03

Solve the below LP model using *Simplex Method.*

Maximize Z = 6X1 + 4X2

Subject to the constraints

$2X1 + 3X2 \leq 30$

$3X1 + 2X2 \leq 24$

$X1 + X2 \leq 10$

$X1, X2 \geq 0$

Check the existence of alternative optima. If an alternative optimum exists, find the alternative solution.

(20 Marks)

Question 04

Solve the below LP model using *Two Phase Method*

Minimize Z = 4X1 + X2

Subject to the constraints

$3X1 + 4X2 \geq 12$

$X1 + 5X2 \geq 15$

$X1, X2 \geq 0$

(20 Marks)

Question 05

Consider the LP model given below;

Minimize Z = 10 X1 + 20 X2

Subject to

$3\ X1 + 2\ X2 \geq 18$

$X1 + 3\ X2 \geq 8$

$2\ X1 + X2 \geq 6$

$X1, X2 \geq 0$

(a) Construct the dual problem, for this primal problem. (04 Marks)
(b) Solve the primal problem using any appropriate method. (16 Marks)

Question 06

A trucking company has a contract to move 115 truckloads of sand per week between three sand-washing plants W,X and Y, and three destinations, A,B and C. Cost and volume information is given below. Compute the optimal transportation cost using North West Corner starting solution. (20 Marks)

	Project A	**Project B**	**Project C**	**Supply**
Plant W	5	10	10	35
Plant X	20	30	20	40
Plant Y	5	8	12	40
Demand	45	50	20	75

02

Question 07

CASE I

Dr. Greru is a dentist who schedules all his patients for 30-minutes appoinments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the variouscategories of work, tehir probabilities and the time actually needed to complete the work.

Table 7.01

CATEGORY	TIME REQUIRED	PROBABILITY OF THE CATEGORY
Filling	45 minutes	0.40
Crown	60 minutes	0.15
Cleaning	15 minutes	0.15
Extraction	45 minutes	0.10
Check-up	15 minutes	0.20

Simulate the dentist's clinic for **FOUR** hours and determine average waiting time for the patients as well as the idleness of the doctor.

Assume that all patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use below random numbers for simulation run.

40 82 11 34 25 66 17 79

(10 Marks)

CASE II

Dr. Greru is planning to recruite a trainee dentist in his dental clinic to reduce the waiting time of his patients. But this Trainee dentist is p[erforming

- Cleaning
- Extraction and
- Checkup jobs ONLY.

Anyway if both of the dentists available, patients are preffered Dr. Greru, as he is more experianced person.

Simulate dentist's clinic again for FOUR hours, and compare the average waiting time of patients in both cases.

(10 Marks)

Question 08

BestDairy produces four types of milk powder packets P1, P2, P3 and P4 using three kinds of raw materials R1, R2 and R3. The amounts of raw materials used to produce one unit of each type of milk powder packet, availability of raw materials and resulting profits are as follows.

02

Table 8.01

	R1	R2	R3	Profit (USD/unit)
P1	3	1	4	19
P2	2	1	3	13
P3	1	1	3	12
P4	1	1	4	17
Availability	225	117	420	

Consider the final feasible tableau given below.

Basis	Z	X1	X2	X3	X4	S1	S2	S3	Value
Z	1	0	1	0	0	2	1	3	1827
X4	0	0	-1	0	1	-1	-5	2	30
X3	0	0	1	1	0	0	4	-1	48
X1	0	1	1	0	0	1	2	-1	39

Convert the optimum tableau into equations and write equations for Z, X_4, X_3 and X_1. (08 Marks)

If BestDairy produces a new "Hi-Cal" Milk powder type, which requires

3 units of R1

1 unit of R2 and

2 units of R3

Gives USD 14 profit.

Find the optimum solution. (12 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Production and Operations Management – POMG0368

- This paper consists of EIGHT questions on NINE (09) pages
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Formulae sheet is attached

Date: 2018.09.22 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) Air travel on Mountain Airlines for the past 18 weeks was as below

Table 1:1 – Passengers

Week	Passengers	Week	Passengers
1	405	10	440
2	410	11	446
3	420	12	451
4	415	13	455
5	412	14	464
6	120	15	466
7	124	16	474
8	433	17	476
9	438	18	482

Use the trend projection technique to develop a forecast for the next three weeks.

(06 Marks)

(b) The manager of a seafood restaurant was asked to establish a pricing policy on lobster dinners. Experimenting with prices produced the following data:

Table 1:2 - Averages sales

Average Number sold per day (y)	Price (x) ($)	Average Number sold per day (y)	Price (x) ($)
200	6	160	8
190	6.5	155	8.25
188	6.75	156	8.5
180	7	148	8.75
170	7.25	140	9
162	7.5	133	9.25

(06 Marks)

(c) Company ABC has accumulated the following historical sales data with some missing information, as shown below

Table 1:3 - Sales

Week	1	2	3	4	5	6	7
Actual Sales	220		580			550	
Forecast Sales			600		550	540	

Use exponential smoothing with $\alpha = 0.6$ for answering the following questions.

(i) Find the sales forecasts for Week 4 and Week 7. (04 Marks)

(ii) Find the actual values for Week 4 and Week 5. (04 Marks)

Question 02

(a) Using the following information, the Branch Manager of a Tourist Centre wants to predict the first quarter of next year demand for the purpose of writing a report to Top Management.

Table 2:1 - Seasonal Relatives

Month	Seasonal Relative	Month	Seasonal Relative
Jan	1.2	Jul	0.8
Feb	1.3	Aug	0.6
Mar	1.3	Sep	0.7
Apr	1.1	Oct	1.0
May	0.8	Nov	1.1
Jun	0.7	Dec	1.4

The monthly forecast equation being used is:

$F_t = 402 + 3t$

Where

t_0 = January of last year

F_t = Number of arrivals

Determine the number of arrivals of the first three months of next year. (10 Marks)

(b) An ABC transporter's records during the last five weeks indicate the number of job requests:

Table 2:2 - Jobs

Week	1	2	3	4	5
Requests	20	22	18	21	22

Predict the number of requests for week 6 using each of these methods:

(i) A four-period moving average (02 Marks)

(ii) Exponential smoothing with $\alpha = 0.3$. Use 20 for week 2 forecast. (08 Marks)

Question 03

(a) Briefly explain the term "Value-added". (03 Marks)

(b) Briefly explain the key differences between production of goods and delivery of services. (07 Marks)

(c) Can you think of a business that doesn't have operations management? Explain. (10 Marks)

Question 04

(a) Identify the four trends of product and service design. (04 Marks)

(b) Breifly explain two activities of product and service design. (06 Marks)

(c) Identify the five reasons for product and service design and explain two. (10 Marks)

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Question 05

For the set of tasks given below, do the following:

(a) Develop the precedence diagram. (02 Marks)

(b) Determine the minimum and maximum cycle times in seconds for a desired output of 500 units in a 7-hour day. Why might a manager use a cycle time of 50 seconds? (02 Marks)

(c) Determine the minimum number of workstations for output of 500 units per day. (03 Marks)

(d) Balance the line using the largest popsitional weight heuristic. Break ties with the most following tasks heuristic. Use a cycle time of 50 seconds. (10 Marks)

(e) Calclate the percentage idle time for the line. (03 Marks)

Table 5:1 – Task Time

Task	Task Time (Seconds)	Immediate Predecessors
A	45	-
B	11	A
C	9	B
D	50	-
E	26	D
F	11	E
G	12	C
H	10	C
I	9	F, G, H
J	10	I
	193	

Question 06

(a) A small firm produces and sells automotive items in a five-state area. The firm, expects to consolidate assembly of its battery charges line at a single location. Currently, operations are in three widely scattered locations. The leading candidate for location will have a monthly fixed cost of $42,000 and variable costs of $3 per charger. Charges sell for $7 each.

(i) Perepare a table that shows total profits, fixed costs, variable costs, and revenues for monthly volumes of 10,000, 12,000, and 15,000 units. (04 Marks)

(ii) What is the break-even point? (02 Marks)

(ii) Determine profit when volume equals 22,000 units. (02 Marks)

(b) The owner of Old-Fashioned Berry Pies, S. Simon, is contemplating adding a new line of pies, which will require leasing new equipment for a monthly payment of $6000. Variable costs would be $2.00 per pie, and pies would retail for $7.00 each.

(i) How many pies must be sold in order to break even? (02 Marks)

(ii) What would the profit (loss) be if 1,000 pies are made and sold in a month? (02 Marks)

(iii) How many pies must be sold to realize a profit of $4,000? (04 Marks)

(iv) If 2,000 can be sold, and a profit target is $5,000, what price should be charged per pie? (04 Marks)

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Question 07

SummerFun, Inc., produces a variety of recreation and leisure products. The production manager has developed an aggregate forecast:

Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Forecast	50	44	55	60	50	40	51	350

Use the following information to develop aggregate plans.

Regular Production cost	Rs. 80 per Unit
Overtime Production cost	Rs. 120 per Unit
Regular capacity	40 units per month
Overtime capacity	8 units per month
Subcontracting cost	Rs. 140 per Unit
Subcontracting capacity	12 units per month
Holding cost	Rs. 10 per unit per month
Back -order cost	Rs. 20 per Unit
Beginning Inventory	0 units

Develop an aggregate plan using regular production. Supplement using inventory, overtime and subcontracting as needed. No backlogs allowed. (20 Marks)

Question 08

(a) Define the "Qualified Worker" according to Work Measurement in Job Design. (04 Marks)

(b) Time study of a work operation yielded an average observed time of 0.25 minutes. The analyst rated the observed worker at 85%. The firm uses a 10% allowance factor. Compute the standard time. (07 Marks)

(c) The data in the table below represent time study observations for a woodworking operation. Based on the observations, determine the standard time for the operation, assuming an allowance of 6 percent of job time.

Table 8.1 - Element Time Observations

Element	Performance Rating	Observations (Minutes per Cycle)					
		1	2	3	4	5	6
1	80%	0.11	0.22	0.35	0.21	0.31	0.22
2	98%	2.46	2.26	2.45	2.35	2.01	2.12
3	99%	1.22	1.35	1.32	3.92*	1.60	1.52

***Unusual delay, disregard time.** (09 Marks)

----------END OF THE QUESTION PAPER----------

Formula Sheet

Simple Moving Average

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots + D_{t-n+1}}{n}$$

D_t : actual demand in period t

n : number of periods in the average

1. **Weighted Moving Average**

$$T_{t+1} = W_1D_1 + W_2D_{t-1} + \ldots + W_nD_{t-n+1}$$

2. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant ($0 \leq \alpha \geq 1$)

4. **Trend Projections**

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2} \qquad a = \bar{y} - b\bar{x}$$

5. **Exponential Smoothing with Trend Adjustment**

$$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$$

$$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$$

$$FIT_t = F_t + T_t$$

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Year 3 Semester II

SEMESTER END EXAMINATION

Project Management – PMGT0364

- This paper consists of EIGHT questions on SEVEN (07) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Use MCQ answer sheet for Question 01

Date: 2018.09.20 Pass mark: 50% Time: 03 Hours

Question 01

1. Which is/are Risk identification tool and techniques?
   A. Brainstorming
   B. Interviewing
   C. SWOT analysis
   D. All above

2. Is not a Risks Category under risk management processes?
   A. Market risk
   B. Financial risk
   C. Technology risk
   D. Product risk

3. The prime objectives of project management are
   A. Time, Cost and Scope
   B. Schedule, Product and Quality
   C. Quality, Risk and Customer satisfaction
   D. Performance, Tests and Product

4. Which one of the following best describes End users of project?
   A. Providers of both strategic and tactical direction to the project.
   B. Those intended to receive benefits of operation of project outputs.
   C. Facilitators of issue resolution procedure.
   D. Those providing full-time commitment to the project.

5. Which of following medium has the highest Information Richness in communication management.
   A. Face to face discussion
   B. Printed letter.
   C. Email
   D. Notice board

6. In a conventional project lifecycle, as project works progress uncertainty about the expected outcome
   A. increases.
   B. Decreases
   C. Remains constant
   D. Increases and then decreases

7. Because the customer is not a member of the performing organization, the customer is not a stakeholder of the project. Is this statement
   A. Ture
   B. False
   C. Ture once the project is completed.
   D. False if the customer rejects the product.

8. Which of the following is a direct project cost?
   A. Lighting and heating for the corporate office
   B. Workers Compensation insurance
   C. Piping for an irrigation project
   D. 1 and 2 above

9. Which of the following statements describes best the relationship between project phases and the project life cycle?

   A. The project life cycle includes the time when the project is performed and the expected product lifespan after that.
   B. In project management, the sequence of project phases and phase gates is often referred to as project life cycle.

C. The project life cycle is regarded as a sequence of project activities while phases are defined to control overlapping activities.
D. The project life cycle describes how iterations of project management processes are used when a project schedule is developed.

10. The processes involving planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget fall under
    A. Project Cost Management
    B. Project Management Process
    C. Project Scope Management
    D. Project Integration Management

11. Which is not a risk Management Process
    A. Quantitative risk analysis
    B. Risk response planning
    C. Risk monitoring and control
    D. Estimation of Cost of risk

12. What are the triple constraints of a project?
    A. Time, schedules and quality
    B. Time, Resources and quality
    C. Time, money, and schedules
    D. Non of above

13. What should be worked out by the project manager to ensure that all works/tasks in the project is included?
    A. Create a contingency plan
    B. Create a risk management plan
    C. Create a WBS
    D. Create a scope statement

14. A temporary endeavor undertaken to create a new product or service is called as
    A. New product development.
    B. Project.
    C. Program.
    D. Enterprise.

15. Which is not a Communication Management process
    A. Information Distribution
    B. Performance Reporting

C. Manage Stakeholders
D. Formal and Informal communication

16. The influence of stakeholders are,
    A. High at initiation of project
    B. High at closure of project
    C. High at mid stage of project
    D. Average through he project period.

17. Which statement is CORRECT regarding the project lifecycle?
    A. Product life cycle is longer than Project Life cycle
    B. Project Life cycle is longer than Product life cycle
    C. Project Life cycle is equals to Product life cycle
    D. Project Life cycle can not be compared with Product life cycle

18. Project scope statement shall be
    A. Prepared by customer
    B. Reviewed by customer
    C. Reviewed by Project Manager
    D. None of above

19. Resource Usage of a practical project mostly shall be
    A. Initially low and increases with project progress.
    B. Initially higher and low down with project progress
    C. Initially low, peak in mid span and again low down throughout project period.
    D. Not a predictable pattern

20. Value adding possibility of a project is
    A. Initially law and increases with project progress.
    B. Initially higher and low down with project progress
    C. Approximately constant throughout project period.
    D. Not a predictable pattern

Question 02

Clear identification of Project requirements and analysis is important in project initiation.

(a) Discuss project requirements and Project Deliverables. (05 Marks)

(b) Explain importance of balancing the triple constraints (Time, Cost, etc) in managing Project. (05 Marks)

(c) Explain the key phases of Project Life Cycle and key responsibilities of Project Manager in each of phases. (05 Marks)

(d) Explain **"Integration of Projects with Organizational Strategy"** (05 Marks)

Question 03

A project is specified by the following activities A,B,C,D,E,Fand G. The durations and relationships each activity is given in the following table.

#	Tasks	Duration	Relationships	Early Start (ES)	Early Finish (EF)	Late Start (ES)	Late Finish (LF)	Slack (S)
1	A	10	-					
2	B	15	finish to start A to B					
3	C	10	finish to start A to C					
4	D	6	finish to start B to D, start to start +5days C to D					
5	E	14	finish to start A to E, finish to finish D to E					
6	F	10	finish to start +12 days C to F finish to start D to F					
7	G	8	finish to start E to G finish to start F to G					

(a) Draw an activity-on-node network to represent the project. (04 marks)

(b) Calculate the expected earliest start and latest start times for each activity and hence the expected slack time for each activity. (08 marks)

(c) Determine the expected project completion time and identify the critical path(s). (04 marks)

(d) Which activities should be monitored most closely by the Project manager? Explain your answer. (04 marks)

Question 04

Estimating Project Time and Cost is the main feature in project planning.

(a) What are the types of costs involving in estimating project expenses/cost? Explain them. (05 marks)

(b) How **'Use several people for estimating'** is important/advantage in estimating time and cost of project. (05 marks)

(c) What is '**Accuracy of Estimates** 'and '**Cost of estimate'**? (05 marks)

(d) What are the practices that estimators can follow to perform high accurate estimates. (05 marks)

Question 05

Defining and controlling what is and is not included in the project, **is the Project scope management**.

(a) What are the advantages of preparing "Project Scope Statement" before planning stage of a project. (10 Marks)

(b) Explain the consequences of a poor 'Work Breakdown Structure (WBS)'. (05 Marks)

(c) What is a milestone in project planning? What are the advantages of establishing millstones in the project? (5 Marks)

(d) How "scope creeping" can damage in projects success. (05 Marks)

Question 06

Project Communication Management plan links all the stockholders with project towards its objectives.

(a) What are the main elements of a typical communication process? (05 Marks)

(b) What are the factors need to be considered in selecting a suitable communication **Channel/Medium** for a project? (05 Marks)

(c) Compare following communication mediums
(i) e-mail
(ii) Telephone
(iii) Printed letters (05 Marks)

(d) What is Information Richness in communication. (05 Marks)

Question 07

Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project.

(a) Explain **Risk Identification** process and **Risks Response planning** process. (08 Marks)

(b) Explain Probability/Impact Matrix in risk management with an example. (06 Marks)

(c) What is "**Top Ten Risk Item Tracking**" in Qualitative Risk Analysis (06 Marks)

Question 08

Stockholder Satisfaction is the key parameter of measuring project success.

(a) List at least 8 key stakeholders in common projects and explain the interests/needs of four of them. (08 Marks)

(b) Explain the importance of Stockholder Management in project management. (06 Marks)

(c) Explain consideration of "Learning Curves" or "Experience curve" concept in estimation time and cost. (06 Marks)

----------END OF THE QUESTION PAPER----------

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01

Year 3 Semester II

SEMETSER END EXAMINATION

Port Planning – PLUT0250

- This paper consists of EIGHT questions on TWO (02) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.

Date: 2018.09.18 Pass mark: 50% Time: 03 Hours

Question –1(Compulsory)

Select one of the following and discuss the impact to Sri Lankan Ports with regard to future port & port facility planning?

(a) What are the port projects in East Coast of India and their impact?

(b) What are the port projects in West Coast of India and their impact?

(c) What are the port projects in Singapore and their impact?

(d) What are the port projects in Oman and their impact?

(e) What are the port projects in Malaysia and their impact?

(f) What are the port projects in Bangladesh and their impact? (20 Marks)

Question – 2

Discuss Sri Lanka Ports Authority VISION 2020 and strategies fostering the aspirations? (20 Marks)

Question – 3

What are the current challenges faced by Ports and your suggestions to resolve the challenges? (20 Marks)

Question – 4

What is the rationale behind building a new port in Hambantota. & discuss how to plan and move forward? (20 Marks)

Question –5

Select one of the cargo handling terminals and draw a full terminal layout to handled three ships at any given time and list out terminal facilities required?

(a) Tank Farm

(b) Liquid & Dry Bulk Handling Terminal

(c) Cruise Terminal (20 Marks)

Question – 6

Select one of the terminals and draw a layout plan and select best facilities / equipment's required?

(a) RO-RO Terminal

(b) Container Terminal

(c) Fully Automated Container Terminal (20 Marks)

Question – 7

"There is a trend that Global Port/Terminal Operators and Shipping Lines invest and operate

Container terminals" discuss with local and foreign examples?

(20 Marks)

Question – 8

Colombo Port Expanded to cater for the Ultra Large Container Ships.

Do you consider it as a viable port project? What are the project features (Navigational & Operational) and your suggestions to move forward?

(20 Marks)

----------*END OF THE QUESTION PAPER*----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT questions on SIX (06) pages
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2018.09.16 Pass mark: 50% Time: 03 Hours

Question 01

"Auto Spares" is a company produces a specific automobile spare part. A contract that the company has signed with a large truck manufacturer calls for the following 4-month shipping schedule.

Month	No of parts to be shipped
January	3000
February	4000
March	5000
April	5000

The company can manufacture 3000 parts per month on a regular time basis and 2000 parts per month on an overtime basis. Its production cost is Rs. 15,000 for a part produced during regular time and 25,000 for a part produced during overtime.

Formulate this problem as an LP model to minimize the overall cost. (20 Marks)

Question 02

Use graphical method to solve the following LP model. (20 Marks)

Max Z = 7X1 + 3X2

Subject to

$X1 + 2X2 \geq 3$

$X1 + X2 \leq 4$

$X1 \leq 5/2$

$X2 \leq 3/2$

$X1, X2 \geq 0$

Question 03

Solve the below LP model using *Simplex Method.* (20 Marks)

Maximize Z = 6X1 + 4X2

Subject to the constraints

$2X1 + 3X2 \leq 30$

$3X1 + 2X2 \leq 24$

$X1 + X2 \leq 10$

$X1, X2 \geq 0$

Check the existence of alternative optima. If an alternative optimum exists, find the alternative solution.

(20 Marks)

Question 04

Max Z = 2X1 + 2X2 + 4X3

$2X1 + X2 + X3 \leq 2$

$3X1 + 4X2 + 2X3 \geq 8$

$X1, X2, X3 \geq 0$

Show that Phase I will terminate with an artificial *basic* variable at zero.

Remove the zero artificial variables prior to the start of Phase II, then carry out Phase II iterations. (20 Marks)

Question 05

MAX z = 3X1 + 6X2 + 4X3

Subject to

X1 + 2X2 + X3 ≤ 10

3X1 + 3X2 + 2X3 ≤ 10

X1, X2, X3 ≥ 0

(a) Construct the dual problem, for this primal problem. (04 Marks)

(b) Solve the primal problem using any appropriate method. (08 Marks)

(c) Solve the dual problem using any appropriate method. (08 Marks)

Question 06

A manufacturing firm has three plants A, B and C with daily output of 500, 300, and 200 units respectively. It also has FOUR warehouses P, Q, R and S with daily requirements of 180, 150, 350 and 320 units respectively. Shipping charges on different routes per unit is as given below.

To	P	Q	R	S
From A	12	10	12	13
From A	7	11	8	14
From C	6	16	11	7

(a) Formulate an LP model for the above transportation model. (05 Marks)

(b) Find the initial solution using North West Corner method. (03 Marks)

(c) Find the optimal solution using any appropriate method. (12 Marks)

Question 07

CASE I

Dr. Greru is a dentist who schedules all his patients for 30-minutes appoinments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the variouscategories of work, tehir probabilities and the time actually needed to complete the work.

Table 7.01

CATEGORY	TIME REQUIRED	PROBABILITY OF THE CATEGORY
Filling	45 minutes	0.40
Crown	60 minutes	0.15
Cleaning	15 minutes	0.15
Extraction	45 minutes	0.10
Check-up	15 minutes	0.20

Simulate the dentist's clinic for **FOUR** hours and determine average waiting time for the patients as well as the idleness of the doctor.

Assume that all patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use below random numbers for simulation run.

40 82 11 34 25 66 17 79

CASE II

Dr. Greru is planning to recruite a trainee dentist in his dental clinic to reduce the waiting time of his patients. But this Trainee dentist is p[erforming

- Cleaning
- Extraction and
- Checkup jobs ONLY.

Anyway if both of the dentists available, patients are preffered Dr. Greru, as he is more experianced person.

Simulate dentist's clinic again for FOUR hours, and compare the average waiting time of patients in both cases.

(20 Marks)

Question 08

BestDairy produces four types of milk powder packets P1, P2, P3 and P4 using three kinds of raw materials R1, R2 and R3. The amounts of raw materials used to produce one unit of each type of milk powder packet, availability of raw materials and resulting profits are as follows.

Table 8.01

	R1	R2	R3	Profit (USD/unit)
P1	3	1	4	19
P2	2	1	3	13
P3	1	1	3	12
P4	1	1	4	17
Availability	225	117	420	

Consider the final feasible tableau given below.

Basis	Z	X1	X2	X3	X4	S1	S2	S3	Value
Z	1	0	1	0	0	2	1	3	1827
X4	0	0	-1	0	1	-1	-5	2	30
X3	0	0	1	1	0	0	4	-1	48
X1	0	1	1	0	0	1	2	-1	39

(a) Convert the optimum tableau into equations and write equations for Z, X_4, X_3 and X_1. (08 Marks)

(b) If BestDairy produces a new "Hi-Cal" Milk powder type, which requires

- 3 units of R1
- 1 unit of R2 and
- 2 units of R3
- Gives USD 14 profit.

Find the optimum solution. (12 Marks)

----------END OF THE QUESTION PAPER----------

Library

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Year 3 Semester II

SEMESTER END EXAMINATION

Airport Planning and Management – APMG0353

- This paper consists of EIGHT questions on THREE (03) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2018.09.14 Pass mark: 50% Time: 03 Hours

Question 01: (Compulsory)

(a) What is capacity and delay in relation to air transport industry (05 Marks)

(b) What are the services and facilities available in an airport (05 Marks)

(c) Explain what is airside and landside in an airport in detail (05 Marks)

(d) What are the possible security threats in air transport industry (05 Marks)

Question 02

(a) List down three factors that contribute towards delay in an airport (05 Marks)

(b) There are different types of runways based on the markings that exist. These markings are decided based on the navigational aids that are available in the airport. Explain these different types of runways based on the markings with graphical illustrations. (15 Marks)

Question 03

(a) Identify 5 different planning studies that are undertaken when planning airport infrastructure. (05 Marks)

(b) What are the methods of security control at commercial airports? Explain two of these methods in detail. (10 Marks)

Question 04

(a) Explain four types of airport terminal configurations with the use of appropriate graphical illustrations to support your answer. (10 Marks)

(b) Discuss the pros and cons of trusted traveler programme and computer assisted passenger screening system (10 Marks)

Question 05

(a) What is meant by FIR? List down three FIRs that are adjoining to the Colombo FIR. (10 Marks)

(b) Explain the how the pilots make use of PAPIs and VASIs when approaching to land in an airport. You may use graphical illustrations to support your answer. (10 Marks)

Question 06

(a) Explain four components of airport master planning in brief. (10 Marks)

(b) Explain what is aeronautical revenue and non-aeronautical revenue of an airport. List down three examples each form each category of revenue (10 Marks)

Question 07

Airports play different roles other than its day-to-day operations that take place. Among these are the environmental role, economic role and the social role that an airport fulfill. Considering Bandaranaike International Airport explain its economic role in detail with examples. (20 Marks)

Question 08

(a) Similar to runway markings and lighting there are different types of signs that are installed in airfields in order to provide more precise and accurate information for pilots to navigate the aircraft in the airfield. These signs fall into different categories. Identify two main categories and two signs each for the categories identified by you with graphical illustration with correct color coding. (10 Marks)

(b) Explain two different types of navigational aids that are used by airport operators to provide more accurate information to pilots when navigating the aircraft. (10 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II
SEMESTER END EXAMINATION
Customs and Commodity Inspection Operations – CCIO0234

- This paper consists of EIGHT questions on four (04) pages.
- Answer Any FIVE questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Formulas for the calculation of taxes and other levies and exchange rates sheets are attached to the question paper.

Date: 2018.09.10 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Good Food International Group is a multinational company based in The Netherlands and owns several wheat cultivating farms in several countries in the world. The Good Food International Group is the rights holder for the internationally popular bakery products under the brand name "Big Bite".

Good Food Canada Ltd is a wheat cultivating company based in Canada. They cultivate and process wheat according to the quality standards set out by Good Food International Group and supply the same only to the buyers nominated by Good Food International Group. Good Food International Group holds 43% of shares of Good Food Canada Ltd and several Directors of Good Food Canada Ltd are also Directors of Good Food International Group.

Good Food Lanka Ltd is a Sri Lankan company registered under the Companies Act. However, Good Food International Group holds 48% of shares of Good Food Lanka Ltd. Several Directors including the Managing Director of Good Food Lanka Ltd are also Directors of Good Food International Group. Good Food International Group has authorized Good Food Lanka Ltd to import wheat in bulk only from Good Food Canada Ltd and manufacture wheat flour in their flour mill situated in Galle Port. During the milling process Good Food Lanka Ltd can manufacture 950kg of pure wheat flour and 50kg of wheat bran from one metric ton of wheat. The wheat flour and wheat bran are

packed in 50kg bags separately and sold for making bakery products and animal feed respectively. A bag of wheat flour is sold at Rs. 4,000/= while a bag of wheat bran is sold at Rs. 1,250/=. According to the tripartite agreement signed between Good Food International Group, Good Food Canada Ltd and Good Food Sri Lanka Ltd, Good Food Sri Lanka Ltd should pay 5% from the sales proceeds of flour and bran to Good Food International Group.

Good Food Lanka has imported a shipment of 20,000 metric tons of wheat from Good Food Canada Ltd in a charted vessel at the FOB price of USD 200 per metric ton. According to the charter party agreement entered into between Good Food Sri Lanka Ltd and the shipping company, the freight charges for a voyage from Canada to Colombo is USD 75,000. In addition to that a pumping charge of USD 5 per metric ton was also payable for discharging the wheat from the vessel to the silos at the Port of Galle.

The marine insurance has been obtained locally from Sri Lanka Insurance Company on payment of Rs. 650,869.60 for the whole shipment.

In the Customs Declaration submitted to Sri Lanka Customs by Good Food Sri Lanka Ltd for the clearance of the said shipment, the Customs Value was given as Rs. 650,869,600/=. The Customs Officers rejected this value and move to calculate the correct Customs Value. Presume that you are the Customs Officer who was entrusted with this task and calculate the Customs Value of the subject shipment in Sri Lankan Rupees. The Exchange Rate is provided in the attached sheet. (20 Marks)

Question 02

Coco Fiber (Pvt) Ltd has imported a consignment of 1x20 container containing 2,621 Broom made of coconut fibre from Malaysia. The price paid is CIF Colombo USD 0.20 per Broom. According to the Sri Lanka Tariff Guide 2017, Broom made of coconut fibre is classified within HS Code 9603.10.10 and the following taxes are payable for the importation.

1. Customs Duty - 30%
2. VAT - 15%
3. PAL - 7.5%
4. NBT - 2%
5. Cess - 20% or Rs. 75/= per unit

6. Excise (SP) Duty - 17% or Rs. 15/= per unit

Calculate all six taxes payable for the above shipment. Exchange Rates and Formulas are provided in the attached documents to this question paper. (20 Marks)

Question 03

(a) Write a short essay about the World Trade Organization (WTO). (03 Marks)

(b) Name the **six methods** given in the WTO Valuation Agreement to determine the Customs Value and explain in detail the **Article 1** and the **Article 8** of the **Schedule E** of the Customs Ordinance of Sri Lanka. (17 Marks)

Question 04

(a) Write a short essay about the World Customs Organisation (WCO). (03 Marks)

(b) Explain in the structuer of a HS Code upto 6 digits and the proceedure one should follow to determin the HS Code of any given commodity. (17 Marks)

Question 05

Explain in detail the first three General Interpretative Rules (GIR) for the interpretation of Harmonized System with suitable examples. (20 Marks)

Question 06

Describe the functions of the Sri Lanka Customs and legislative framework related to such functions. (20 Marks)

Question 07

Explain Section 10 and Section 12 of the Customs Ordinance including a detail explanation of the Schedule A and Schedule B. (20 Marks)

Question 08

Write short essays on 4 of the following topics.

(a) Customs Ordinance
(b) Imports and Exports (Control) Act
(c) INCOTERMS
(d) Methods of payment in international trade
(e) Value of identical goods and similar goods
(f) Trade agreements
(g) Roles of Sri Lanka Customs

(20 Marks)

----------END OF THE QUESTION PAPER----------

Computation formulae for imported goods

Where

v	=	CIF value in Rupee
c	=	Cess levy under Sri Lanka Export Development Act
d	=	Customs Duty
e	=	Excise (Special Provisions) Duty (ED)
t	=	Value Added Tax (VAT)
n	=	Nation Building Tax
p	=	Port and Airport Development Levy (PAL)
r_e	=	Rate of Excise (Special Provisions) Duty (ED)
r_t	=	Rate of Value Added Tax (VAT)
r_n	=	Rate of Nation Building Tax

- Customs Duty (d) = (CIF value) × (Customs duty rate)
  or
  = (quantity) × (unit rate of customs duty)

- Value Added Tax (t) = (v + 10% of v + d + c + p + e) × r_t

- Cess Levy (c) = (v + 10% of v) × (Cess levy rate)
  or
  = (quantity) × (unit rate of Cess levy)

- Port and Airport Development Levy (p) = (CIF value) × (PAL rate)

- Excise (Special Provisions) Duty (e) = (v + 15% of v+ d + c + p)× r_e
  or
  = (quantity) × (unit rate of Excise Duty)

- Special Commodity Levy = (Quantity) × (unit rate of Special Commodity Levy)

- Nation Building Tax (n) = (v +10%v + d + c + p + e) r_n

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Schedule

Rates of Exchange Effective From 03.09.2018 to 09.09.2018

	Country	Country Code	Currency	Currency Code	Rate of Exchange (Rs.)
1	Australia	AU	Dollar	AUD	117.9916
2	Bahrain	BH	Dinar	BHD	431.4610
3	Bangladesh	BD	Taka	BDT	1.9420
4	Brazil	BR	Brazil Real	BRL	39.2148
5	Brunei	BN	Brunei Dollar	BND	119.0455
6	Canada	CA	Canadian Dollar	CAD	124.9978
7	China	CN	Renminbi	CNY	23.8150
8	China	CN	Offshore	CNH	23.7785
9	Czechoslovakia	CZ	Koruna	CZK	7.3648
10	Denmark	DK	Kroner	DKK	25.4571
11	Egypt	EG	Pound	EGP	9.1277
12	Euro Zone		Euro	EUR	189.8119
13	Ghana	GH	Cedi	GHS	33.8000
14	Hongkong	HK	Dollar	HKD	20.7348
15	Hungary	HU	Forint	HUF	0.5803
16	India	IN	Rupee	INR	2.3005
17	Indonesia	ID	Rupiah	IDR	0.0111
18	Iran	IR	Riyal	IRR	0.0039
19	Japan	JP	Yen	JPY	1.4665
20	Jordan	JO	Dinar	JOD	229.3828
21	Korea	KR	Won	KRW	0.1463
22	Kuwait	KW	Dinar	KWD	537.6515
23	Macau	MO	Pataca	MOP	20.1320
24	Malaysia	MY	Ringgit	MYR	39.6027
25	Maldives	MV	Rufiya	MVR	10.5270
26	Mauritius	MU	Rupee	MUR	4.7448
27	Myanmar	MM	Kyat	MMK	0.1064
28	Nepal	NP	Rupee	NPR	1.4378
29	New Zealand	NZ	Dollar	NZD	108.0641
30	Nigeria	NG	Naira	NGN	0.5325
31	Norway	NO	Kroner	NOK	19.4946
32	Oman	OM	Riyal	OMR	422.7143
33	Pakistan	PK	Rupee	PKR	1.3226
34	Papua New Guinea	PG	Kina	PGK	48.9869
35	Philippines	PH	Peso	PHP	3.0434
36	Poland	PL	Zloty	PLN	44.1270
37	Qatar	QA	Riyal	QAR	44.6893
38	Russia	RU	Rouble	RUB	2.3879
39	Saudi Arabia	SA	Riyal	SAR	43.3917
40	Seychelles	SC	Rupee	SCR	11.9579
41	Singapore	SG	Dollar	SGD	119.0455
42	South Africa	ZA	Rand	ZAR	11.0457
43	Sweden	SE	Krona	SEK	17.8386
44	Switzerland	CH	Francs	CHF	168.0751
45	Taiwan	TW	Dollar	TWD	5.3017
46	Thailand	TH	Baht	THB	4.9694
47	U.A.E.	AE	Dirham	AED	44.3072
48	United Kingdom	GB	Sterling Pound	GBP	211.7665
49	United States of America	US	Dollar	USD	162.7471
50	Zambia (Old)	ZM	Kwacha	ZMK	0.0313
51	Zambia (New)	ZM	Kwacha	ZMW	15.9166
52	Zimbabwe	ZW	Dollar	ZWD	0.4288

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Year 3 Semester II
REPEAT EXAMINATION

Production and Operations Management – POMG0368

- This paper consists of EIGHT questions on Eight (08) pages.
- Answer Any FIVE questions including question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2017.12.10 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) ABC corporation sells radio frequency inventory tags. Monthly sales for a seven-month period were as follows:

Table 1:1 – Monthly Sales

Month	Sales (000 units)
Feb	19
Mar	18
Apr	15
May	20
Jun	18
Jul	22
Aug	20

(i) Forecast September sales volume using each of the following;

a. A linear trend equation (02 marks)

b. A five-month moving average (02 Marks)

c. Exponential smoothing with a smoothing constant equal to 0.20, assuming a march forecast of 19(000) (02 Marks)

d. The naïve approach (02 Marks)

e. A weighted average using 0.60 for August, 0.30 for July, and 0.10 for June. (02 Marks)

(b) Freight car loadings over a 12-year period at a busy port are as follows;

Table 1:2 – Freight Car Loadings

Week	Number	Week	Number	Week	Number
1	220	7	350	13	460
2	245	8	360	14	475
3	280	9	400	15	500
4	275	10	380	16	510
5	300	11	420	17	525
6	310	12	450	18	541

(i) Determine a linear trend line for freight car loadings. (03 Marks)

(ii) Use the trend equation to predict loadings for weeks 20 and 21. (03 Marks)

(iii) The manager intends to install new equipment when the volume exceeds 800 loadings per week. Assuming the current trend continues, the loading volume will reach that level approximately in which week? (04 Marks)

Question 02

(a) A tourist center is open on weekends (Friday, Saturday, and Sunday). The owner-manager hopes to improve scheduling of part-time employees by determining seasonal relatives for each of these days on recent traffic at the center have been tabulated and are shown in the following table:

Table 2:1 – Seasonal Relatives

Week	1	2	3	4	5	6
Friday	149	154	152	150	159	163
Saturday	250	255	260	268	273	276
Sunday	166	162	171	173	176	183

(i) Develop seasonal relatives for the shop. (06 Marks)

(ii) Use a naïve approach to predict sales transactions for the following week. (04 Marks)

(b) Air travel on Mountain Airlines for the past 18 weeks was:

Table 2:2 – Passengers

Week	**Passengers**
1	405
2	410
3	420
4	415

5	412
6	420
7	424
8	433
9	438
10	440
11	446
12	451
13	455
14	464
15	466
16	474
17	476
18	482

(i) Explain why an averaging technique would not be appropriate for forecasting.

(03 Marks)

(ii) Use an appropriate technique to develop a forecast for the next three weeks.

(07 Marks)

Question 03

(a) Briefly explain the term "Value-added". (03 Marks)

(b) Briefly explain the key differences between production of goods and delivery of services. (07 Marks)

(c) Can you think of a business that doesn't have operations management? Explain.

(10 Marks)

Question 04

(a) Identify the main activities of product and service design. (04 Marks)

(b) Breifly explain the factors that cause organisations to redesign their products or services? (08 Marks)

(c) Briefly explain the main sources of ideas for product and service design. (08 Marks)

Question 05

For the set of tasks given below, do the following:

(a) Develop the precedence diagram. (03 Marks)

(b) Determine the minimum and maximum cycle times in seconds for a desired output of 500 units in a 7-hour day. Why might a manager use a cycle time of 50 seconds? (02 Marks)

(c) Determine the minimum number of workstations for output of 500 units per day. (03 Marks)

(d) Balance the line using the largest popsitional weight heuristic. Break ties with the most following tasks heuristic. Use a cycle time of 50 seconds. (10 Marks)

(e) Calclate the percentage idle time for the line. (02 Marks)

Table 5:1 – Task Time

Task	Task Time (Seconds)	Immediate Predecessors
A	45	-
B	11	A
C	9	B
D	50	-

E	26	D
F	11	E
G	12	C
H	10	C
I	9	F, G, H
J	10	I
	193	

Question 06

(a) A plant was designed to produce 7,000 hammers per day, but it is limited to making 6,000 hammers per day, because of the time needed to change equipment between styles of hammers, what is utilization? (03 Marks)

(b) For the past month, which has an effective capacity of 6,500, has made only 4,500 hammers per day, because of material delay, employee absence and other problems. What is its efficiency? (03 Marks)

(c) A product at ABC Company has enjoyed reasonable sales volumes, but its' contribution to profits has been disappointing. Last year, 17,500 units were produced and sold. The selling price is Rs.22.00 per unit. Variable cost and fixed costs are Rs.8.00 and Rs. 80,000 respectively.

(i) What is the breakeven quantity? Explain your answer using an appropriate graph. (06 Marks)

(ii) Management of the "ABC" Company believes that sales can be increased by 30% or that variable cost can be reduced to 85% of its current level. Which

alteration will be the best (increasing sales or reducing variable cost) if both alternations are equally cost to implement. (08 Marks)

Question 07

Planners for a company that makes several models of skateboards are about to prepare the aggregate plan that will cover six periods. They have assembled the following information:

Period	1	2	3	4	5	6	Total
Forecast	200	200	300	400	500	200	1,800

Costs

Output

Regular time	= $2 per skateboard
Overtime	= $3 per skateboard
Subcontract	= $6 per skateboard
Inventory	= $1 per skateboard per period on average inventory
Backorders	= $5 per skateboard per period

Suppose that the regular output rate is 290 units per period due to an expected change in production requirements. Use overtime at a fixed rate of 20 units per period as needed. Plan for an ending inventory of zero for period 6. Backlogs cannot exceed 90 units per period. Prepare an aggregate plan and determine its cost. (20 Marks)

Question 08

(a) Define a "Qualified Worker" and "Standard Performance" according to Work Measurement in Job Design. (06 Marks)

(b) Time study of a work operation yielded an average observed time of 2.00 minutes. The analyst rated the observed worker at 78%. The firm uses a 9% allowance factor. Compute the standard time. (06 Marks)

(c) The data in the table below represent time study observations for a woodworking operation. Based on the observations, determine the standard time for the operation, assuming an allowance of 15 percent of job time.

Element	Performance Rating	Observations (Minutes per Cycle)					
		1	2	3	4	5	6
1	110%	1.1	1.2 7	1.05	1.01	1.21	1.01
2	115%	0.83	0.87	0.78	0.82	0.85	1.32*
3	105%	0.55	0.5	0.51	0.59	0.59	0.54

***Unusual delay, disregard time.** (08 Marks)

----------END OF THE QUESTION PAPER----------

Formula sheet

1. **Simple Moving Average**

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots + D_{t-n+1}}{n}$$

D_t : actual demand in period *t*

n : number of periods in the average

2. **Weighted Moving Average**

$$T_{t+1} = W_1 D_1 + W_2 D_{t-1} + \ldots + W_n D_{t-n+1}$$

3. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant ($0 \leq \alpha \geq 1$)

4. Trend Projections

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2}$$

$$a = \bar{y} - b\bar{x}$$

5. Exponential Smoothing with Trend Adjustment

$$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$$

$$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$$

$$FIT_t = F_t + T_t$$

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Year 3 Semester II

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REPEAT EXAMINATION

Port Planning – PLUT0250

- This paper consists of EIGHT questions on TWO (02) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.12.09 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

What are the challengers that a Port Planner should consider when planning future port infrastructure, superstructure and port operations? (20 Marks)

Question 02

If you are appointed as a Project Design Engineer for a Pure Car Carrier - RO-RO terminal project:

(a) Draw a RO-RO terminal plan that can berth three ships
(b) List out key terminal facilities & staff requirement (20 Marks)

Question 03

What are the equipment's that can be used for a container terminal? (20 Marks)

Question 04

'Today Sri Lankan Port investment, operation and management model has changed to PPP and BOT'
Discuss and comment with examples? (20 Marks)

Question 05

Compare Colombo Port Expansion Project facilities with **one** of the following?

(a) Vizinjam Port in Kerala
(b) Busan or any South Korean Port.
(c) Cochin - Vallapadam in Kerala
(d) Enayam Port in Tamil Nadu State in India (20 Marks)

Question 06

Select **one** of the port cargo handling terminals

(a) Container Terminal

(b) Liquid Bulk Terminal

(c) Dry Bulk Terminal

(d) Cruise Terminal

and draw a layout plan and identify terminal facilities requirements?

(20 Marks)

Question 07

What are the advanced navigational facilities that you recommend for a new port?

(20 Marks)

Question 08

Describe Port Planning methodology that you are going to consider when deciding to build a new port facility.

(20 Marks)

----------END OF THE QUESTION PAPER----------

Colombo International Nautical and Engineering College
CINEC Campus
Faculty of Management, Humanities & Social Sciences
Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

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Year 3 Semester II

REPEAT EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT questions on SIX (06) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.12.08 Pass mark: 50% Time: 03 Hours

Question 01

Logitech has two factories that ship to three regional warehouses. The costs of transportation per unit are as follows.

Table 1.01: Unit transportation cost

Warehouse	Transportation cost (Rs)	
	Factory 01	Factory 02
Warehouse 01	2	4
Warehouse 02	2	2
Warehouse 03	5	3

Factory 02 is old and has a variable manufacturing cost of Rs. 20/- per unit. Factory 01 is modern and produces for Rs. 10/-. Factory 01 has a monthly capacity of 400units and Factory 02 has a monthly capacity of 250 units.

The requirement of three warehouses is follows.

Table 2: Demand at three warehouses

Warehouse	Demand (in units)
Warehouse 01	200
Warehouse 02	100
Warehouse 03	250

How should each factory ship to each warehouse in order to minimize the total cost? Formulate this problem as a LP model
(Hint: Total Cost associated in shipping 1 unit from i^{th} factory to j^{th} warehouse = Unit Variable manufacturing cost of i^{th} factory + unit transportation cost from i^{th} Factory to J^{th} Warehouse)

(20 Marks)

Question 02

G-flok is a cloth manufacturer who employs three inputs: man-hours, machine-hours and cloth materials to manufacture two types of dresses. Type A dress makes a profit of Rs. 160/- per dress and type B makes Rs. 180/- per dress. The manufacturer has enough man-hours to manufacture 50 dresses of type A or 20 dresses of type B per day while the machine-hours he possesses suffice only for 36 dresses of type A or for 24 dresses of type B.

Cloth material available per day is limited but sufficient enough for 30 dresses of either type.

(i). Formulate this a a LP model (05 Marks)

(ii). Solve the model using graphical method. (15 Marks)

Question 03

Solve the below LP model using *Simplex Method.*

Maximize Z = 6X1 + 4X2

Subject to the constraints

$2X1 + 3X2 \leq 30$

$3X1 + 2X2 \leq 24$

$X1 + X2 \leq 10$

$X1, X2 \geq 0$

Check the existence of alternative optima. If an alternative optimum exists, find the alternative solution.

(20 Marks)

Question 04

Solve the below LP model using *Two Phase Method*

Minimize Z = 4X1 + X2

Subject to the constraints

$3X1 + 4X2 \geq 12$

$X1 + 5X2 \geq 15$

$X1, X2 \geq 0$ (20 Marks)

Question 05

Consider the LP model given below;

Minimize Z = 10 X1 + 20 X2

Subject to

$3\ X1 + 2\ X2 \geq 18$

$X1 + 3\ X2 \geq 8$

$2\ X1 + X2 \geq 6$

$X1, X2 \geq 0$

(a) Construct the dual problem, for this primal problem. (05 Marks)

(b) Solve the primal problem using any appropriate method. (15 Marks)

Question 06

A manufacturer has 03 distribution centers at Colombo, Galle and Gampaha. These centers have availability of 40, 20 and 40 units supplyrespectively. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units respectively. Unit trasnportation cost is given in Table 6.01 given below.

Table 6.01

	A	B	C	D	E	Supply
Colombo	55	30	40	50	40	40
Galle	35	30	100	45	60	20
Gampaha	40	60	95	35	30	40
Demand	25	10	20	30	15	

(a) Find the initial transportation schedule using *North West Corner Method.* (05 Marks)

(b) Find the optimum transportation schedule using *Method of Multipliers (U-V Method).* (15 Marks)

Question 07

Dr. Jayasinghe is a dentist who schedules all his patients for 30-minutes appoinments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the variouscategories of work, tehir probabilities and the time actually needed to complete the work.

Table 7.01

CATEGORY	TIME REQUIRED	PROBABILITY OF THE CATEGORY
Filling	45 minutes	0.40
Crown	60 minutes	0.15
Cleaning	15 minutes	0.15
Extraction	45 minutes	0.10
Check-up	15 minutes	0.20

Simulate the dentist's clinic for **FOUR** hours and determine average waiting time for the patients as well as the idleness of the doctor.

Assume that all patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use below random numbers for simulation run.

40 82 11 34 25 66 17 79

(20 Marks)

Question 08

BestDairy produces four types of milk powder packets P1, P2, P3 and P4 using three kinds of raw materials R1, R2 and R3. The amounts of raw materials used to produce one unit of each type of milk powder packet, availability of raw materials and resulting profits are as follows.

Table 8.01

	R1	R2	R3	Profit (USD/unit)
P1	3	1	4	19
P2	2	1	3	13
P3	1	1	3	12
P4	1	1	4	17
Availability	225	117	420	

Consider the final feasible tableau given below.

Basis	Z	X1	X2	X3	X4	S1	S2	S3	Value
Z	1	0	1	0	0	2	1	3	1827
X4	0	0	-1	0	1	-1	-5	2	30
X3	0	0	1	1	0	0	4	-1	48
X1	0	1	1	0	0	1	2	-1	39

(a) Convert the optimum tableau into equations and write equations for Z, X_4, X_3 and X_1. (08 Marks)

(b) If BestDairy produces a new "Hi-Cal" Milk powder type, which requires

- 3 units of R1
- 1 unit of R2 and
- 2 units of R3
- Gives USD 14 profit.

Find the optimum solution. (12 Marks)

----------END OF THE QUESTION PAPER----------

Colombo International Nautical and Engineering College

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Year 3 Semester II
REPEAT EXAMINATION
ECONOMETRICS – ECON0321

22

- This paper consists of EIGHT questions on NINE (09) pages.
- Answer FIVE questions including question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legible.
- Statistical tables and formulae sheets are attached.

Date: 2017.12.07 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) What is meant by econometrics? (05 Marks)

(b) Explain traditional econometric methodology. (06 Marks)

(c) What is the difference between theoretical econometrics and applied econometrics? (04 Marks)

(d) Why do you use "Cronbach's Alpha" in research studies? (05 Marks)

Question 02

(a) Finance Manager of one company says that their annual sales income is in average Rs.200 Million. Sales income data are provided for last 10 year period.

197.0, 200.5, 202.1, 196.3, 194.7, 199.2, 201.0, 204.2, 198.3, 201.2

(i) Test the statement of the Finance Manager. (06 Marks)

(ii) Estimate the confidence interval of the difference. (04 Marks)

(b) Independent sample t test has been carried out to study whether there is any significant difference between the incomes saving of employees in relation to gender. Results are provided by independent sample t-test below. Interpret the results.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Income Saving	Equal variances assumed	.612	.434	-.074	404	.941	-.00388	.05282	-.10773	.09996
	Equal variances not assumed			-.074	402.187	.941	-.00388	.05266	-.10741	.09964

(06 Marks)

(c) Management of a company introduced an ERP system to increase the business operations. Speed of the quality control has been evaluated before and after the ERP system was introduced. Results are provided by the following paired sample t test. Interpret the test results.

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Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1 Speed	-2.77102	.54692	.02714	-2.82438	-2.71766	-102.089	405	.000

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before	.5803	406	.22901	.01137
	After	3.3513	406	.51865	.02574

(04 Marks)

Question 03

(a) Describe assumptions of Classical Linear Regression Model (CLRM). (08 Marks)

(b) Following Multiple Regression Model has been constructed to predict the effect of price and other price on sales income of a company. Interpret the results.

Dependent Variable: Sales Income
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	82170.21	9267.115	8.866859	0.0000
PRICE	-977.2441	301.2727	-3.243720	0.0031
Other Price	2857.989	1153.059	2.478615	0.0197

R-squared	0.285885	Mean dependent var	69200.00
Adjusted R-squared	0.232987	S.D. dependent var	8214.369
S.E. of regression	7194.084	Akaike info criterion	20.69455
Sum squared resid	1.40E+09	Schwarz criterion	20.83466
Log likelihood	-307.4182	Hannan-Quinn criter.	20.73937
F-statistic	5.404509	Durbin-Watson stat	2.251228
Prob(F-statistic)	0.010614		

(05 Marks)

(c) What is your decision according to Heteroskedasticity Test results?

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.953594	Prob. F(2,27)	0.1613
Obs*R-squared	3.792504	Prob. Chi-Square(2)	0.1501
Scaled explained SS	1.309366	Prob. Chi-Square(2)	0.5196

(03 Marks)

(d) Interpret the following Correlogram Q Statistics.

Sample: 1 30
Included observations: 30

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.191	-0.191	1.2044	0.272
. | . |	.*| . |	2	-0.060	-0.100	1.3282	0.515
. | . |	.*| . |	3	-0.041	-0.076	1.3872	0.709
. |*** |	. |*** |	4	0.461	0.454	9.2203	0.056
.*| . |	. | . |	5	-0.146	0.031	10.038	0.074
. | . |	. | . |	6	0.011	0.062	10.043	0.123
.*| . |	.**| . |	7	-0.172	-0.214	11.273	0.127
. |**** |	. |*** |	8	0.546	0.390	24.303	0.002
.*| . |	. | . |	9	-0.135	0.041	25.133	0.003
.*| . |	.*| . |	10	-0.086	-0.067	25.487	0.004

(04 Marks)

Question 04

(a) Management of a transport company need to test whether there is any difference between the transport mode "A" and "B". Customers' responses have been taken and the marks have been given a scale from 1 to 9. Scale 1 represents very bad and scale 9 excellent. Following information is given for 10 customers. Test whether there is any difference between the two transport modes or not at 5% level of significance.

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Mode "A"	8	7	6	8	5	8	5	7	6	6
Mode "B"	6	5	6	4	9	6	5	6	5	6

(08 Marks)

(b) One producer says that there is not any difference between three products in relation to durability. Four samples from each product have been tested and the durability in years is given below. Construct a one way ANOVA and test the statement at 5% level of significance.

Product "A"	Product "B"	Product "C"
1	2	3
3	3	4
2	4	4
2	3	5

(12 Marks)

Question 05

(a) What is the condition to use Restricted and Unrestricted VAR in econometrics studies? (04 Marks)

(b) Interpret the following Augmented Dickey Fuller unit root test results.

Variables	Probability at level	Probability at 1st difference
Gross Domestic Product (GDP)	0.4527	0.000
Domestic debt (DD)	0.6411	0.000
Education expenditure (EDU)	0.6536	0.000

(03 Marks)

(c) A researcher has carried out Lag length criterion to construct Vector Error Correction Model (VECM) for the above variables. Advise the researcher using following test results.

VAR Lag Order Selection Criteria

Endogenous variables: GDP DD EDU

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-394.6303	NA	5869209.	24.09881	24.23485	24.14458
1	-219.7184	307.4209*	253.0288*	14.04354*	14.58773*	14.22664*
2	-214.9031	7.587799	331.3408	14.29716	15.24948	14.61758
3	-209.9552	6.897003	440.5600	14.54274	15.90320	15.00050

(06 Marks)

(d) Interpret the following VECM results.

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Dependent Variable: D(GDP)
Method: Least Squares
Sample (adjusted): 1979 2012
Included observations: 34 after adjustments
D(GDP) = C(1)*(GDP(-1) - 0.549297283642*DD(-1) - 5.36876622543E-06 *EDU(-1) - 3.39994041486) + C(2)*D(GDP(-1)) + C(3)*D(DD(-1)) + C(4)*D(EDU(-1)) + C(5)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.072813	0.029820	-2.441722	0.0210
C(2)	0.081901	0.161797	0.506198	0.6165
C(3)	0.143129	0.123601	1.157993	0.2563
C(4)	4.53E-06	1.71E-06	2.656173	0.0127
C(5)	0.091975	0.030252	3.040322	0.0050

R-squared	0.332716	Mean dependent var	0.141786
Adjusted R-squared	0.240677	S.D. dependent var	0.051618
S.E. of regression	0.044980	Akaike info criterion	-3.230153
Sum squared resid	0.058672	Schwarz criterion	-3.005688
Log likelihood	59.91260	Hannan-Quinn criter.	-3.153604
F-statistic	3.614942	Durbin-Watson stat	2.072252
Prob(F-statistic)	0.016510		

(07 Marks)

Question 06

(a) Why do you use dummy variables in econometrics models? (03 Marks)

(b) What is meant by "Dummy variable trap"? (04 Marks)

(c) Briefly explain Logistic Regression model (03 Marks)

(d) A researcher expects to study the willingness to study among the people. Variables have been coded as willingness to study 1, otherwise 0. Marital status has been coded as married 1, single 0. High and Low income levels have been coded respectively as 1 and 0. Logit model provides the following estimated results.

Dependent Variable: Willingness to study

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Marital status	-.742	.240	9.547	1	.002	.476
Monthly income	.236	.121	3.829	1	.050	1.266
Constant	.424	.659	.414	1	.520	1.529

Construct Logistic regression model and calculate probabilities of willingness to study if a person is married with high income.

(10 Marks)

Question 07

(a) Explain the volatility clustering of economic data. (04 Marks)

(b) Define Null and Alternative hypotheses of ARCH test. (04 Marks)

(c) Why do you use Mean and Variance equations in ARCH family models? (02 Marks)

(d) How can you select the appropriate model from ARCH family? (04 Marks)

(e) Researcher constructed GARCH model to study the volatility clustering of return. Interpret the results. 22

Dependent Variable: RETURN
Method: ML - ARCH (Marquardt) - Normal distribution
Sample: 1 200
Included observations: 200
Convergence achieved after 11 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.82E-05	0.000902	-0.020133	0.9839
	Variance Equation			
C	9.44E-06	7.79E-06	1.211823	0.2256
RESID(-1)^2	0.159263	0.047317	3.365851	0.0008
GARCH(-1)	0.800646	0.065881	12.15288	0.0000

R-squared	-0.000258	Mean dependent var	-0.000239
Adjusted R-squared	-0.015568	S.D. dependent var	0.013759
S.E. of regression	0.013865	Akaike info criterion	-5.787334
Sum squared resid	0.037680	Schwarz criterion	-5.721368
Log likelihood	582.7334	Hannan-Quinn criter.	-5.760639
Durbin-Watson stat	2.025302		

(06 Marks)

Question 08

Write short notes on followings.

(a) Jarque-Bera test

(b) Serial correlation

(c) Durbin Watson test statistics

(d) Cholesky dof adjusted method

(e) Heteroscedasticity (5*4 Marks)

----------END OF THE QUESTION PAPER----------

Library

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Year 3 Semester II

SEMESTER END EXAMINATION

Production and Operation Management – POMG0368

- This paper consists of EIGHT questions on TEN (10) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.10.01 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

(a) An electrical contractor uses exponential smoothing to forecast equipment usage at its main branch. August usage was forecast to be 88 percent of capacity; actual usage was 89.6 percent of capacity. A smoothing constant of 0.1 is used.

(i) Prepare a forecast for September. (04 Marks)

(ii) Assuming actual September usage of 92 percent, prepare a forecast for October usage. (04 Marks)

(b) Obtain the linear trend equation for the following data on new checking accounts at a savings bank and use it to predict new checking accounts for periods 16 through 19.

Table 1:1 – New Accounts

Period	New Accounts	Period	New Accounts
1	200	9	200
253	214	10	214
267	211	11	211
281	228	12	228
275	235	13	235
280	232	14	232
288	248	15	248
310	250		

(06 Marks)

(c) The following data represent the industry sales(x) and corporation ABC's annual sales (y) of toddler clothes.

Table 1:2 – Sales

Year	Industry sales (X) ($ millions)	ABC's Sales (Y) ($ millions)
1	1103	105
2	1250	117
3	1097	110

4	955	101
5	945	97
6	903	92
7	1025	104
8	1170	116

If the industry estimate of next year's sales is $1300 million, forecast ABC's annual sales for next year using casual linear regression. (06 Marks)

Question 02

(a) Using the following information, the Branch Manager of a Tourist Centre wants to predict the first quarter of next year demand for the purpose of writing a report to Top Management.

Table 2:1 – Seasonal Relatives

Month	Seasonal Relative	Month	Seasonal Relative
Jan	1.2	Jul	0.8
Feb	1.3	Aug	0.6
Mar	1.3	Sep	0.7
Apr	1.1	Oct	1.0
May	0.8	Nov	1.1
Jun	0.7	Dec	1.4

The monthly forecast equation being used is:

$F_t = 402 + 3t$

Where

t_0 = January of last year

F_t = Number of arrivals

Determine the number of arrivals of the first three months of next year. (10 Marks)

(b) A farming cooperative manager wants to estimate relatives for grain shipments, based on the data shown (quantities are in metric tons)

Table 2:2 - Quarter Grain Shipments

	QUARTER			
Year	1	2	3	4
1	200	451	100	200
2	225	456	125	212
3	210	500	123	202
4	241	472	101	256
5	195	525	152	233

Determine quarter relatives. (10 Marks)

Question 03

(a) Briefly describe the term "Operations Management". (05 Marks)

(b) Identify the three major functional areas of business organizations and briefly describe how they interelate? (06 Marks)

(c) Describe the operations functions and the nature of the operations manager's job. (09 Marks)

Question 04

(a) Identify the main activities of product and service design. (04 Marks)

(b) Breifly explain the factors that cause organisations to redesign their products or services? (08 Marks)

(c) Briefly explain the main sources of ideas for product and serivice design. (08 Marks)

Question 05

(a) A large manufacturer of erasers is planning to add a new line of erasers, and you have been asked to balance the process, given the following task times and precedence relationships. Assume that cycle time is to be the minimum possible.

Table 5:1 - Task Time

Task	Lenghth (Minutes)	Immediate Follower
a	0.2	b
b	0.4	d
c	0.3	d
d	1.3	g
e	0.1	f
f	0.8	g
g	0.3	h
h	1.2	end

(i) Draw the precedence diagram. (02 Marks)

(ii) Assign tasks to stations in order of greatest number of following tasks.

(08 Marks)

(iii) Determine the percentage of idle time. (02 Marks)

(iv) Compute the rate of output that could be expected for this line assuming a 420-minute working day. (04 Marks)

(v) What is the shortest cycle time that will permit use of only two workstations? Is this cycle time feasible? (04 Marks)

Question 06

(a) Determine the utilization and the efficiency for each of these situations:

(i) A loan processing operation that processes an average of 7 loans per day. The operations have a design capacity of 10 loans per day and an effective capacity of 8 loans per day. (02 Marks)

(ii) A furnace repair team that services an average of four furnaces a day if the design capacity is six furnaces a day and eh effective capacity is five furnace a day? (02 Marks)

(b) A small firm intends to increase the capacity of a bottleneck operation by adding a new equipment. Two alternatives, A and B, have been identified, and the associated costs and revenues have been estimated. Annual fixed costs would be $40,000 for A and $30,000 for B; variable cost per unit would be $10 for A and $11 for B; and revenue per unit would be $15.

(i) Determine each alternative's break-even point in units. (03 Marks)

(ii) At what volume of output would the two alternatives yield the same profit? (03 Marks)

(iii) If expected annual demand is 12,000 units, which alternative would yield the higher profit? (03 Marks)

(c) Table 6:1 – Payoff

		New bridge	No new bridge
Alternative capacity for new store	A	1	14
	B	2	10
	C	3	6

Assume the payoff represent profits.

Using the probabilities of 0.6 for a new bridge and 0.4 for no new bridge construct a decision tree and find the best decision. (07 Marks)

Question 07

SummerFun, Inc., produces a variety of recreation and leisure products. The production manager has developed an aggregate forecast:

Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Forecast	50	44	55	60	50	40	51	350

Use the following information to develop aggregate plans.

Regular Production cost - Rs. 80 per unit
Regular capacity - 40 units per month
Subcontracting cost - Rs. 140 per Unit
Subcontracting capacity - 12 units per month
Beginning Inventory - 0 units

Overtime cost - Rs. 120 per Unit
Overtime capacity - 8 units per month
Holding cost - Rs. 10 per unit per month
Back -order cost - Rs. 20 per Unit

Develop the aggregate plan using a combination of backlogs, subcontracting, and inventory to handle variations in demand. (20 Marks)

Question 08

(a) Define the "Qualified Worker" according to Work Measurement in Job Design. (04 Marks)

(b) Time study of a work operation yielded an average observed time of 0.05 minutes. The analyst rated the observed worker at 85%. The firm uses a 101% allowance factor. Compute the standard time. (07 Marks)

(c) The data in the table below represent time study observations for a woodworking operation. Based on the observations, determine the standard time for the operation, assuming an allowance of 7 percent of job time.

Element	Performance Rating	Observations (Minutes per Cycle)					
		1	2	3	4	5	6
1	80%	1.11	1.21	0.85	1.01	1.31	1.22
2	98%	1.46	1.26	1.45	1.35	3.56*	1.12
3	99%	0.22	0.35	0.32	2.92*	0.60	0.52

***Unusual delay, disregard time.** (09 Marks)

----------END OF THE QUESTION PAPER----------

Formula sheet

1. **Simple Moving Average**

$$F_{t+1} = \frac{D_t + D_{t-1} + \ldots\ldots + D_{t-n+1}}{n}$$

D_t : actual demand in period *t*

n : number of periods in the average

2. **Weighted Moving Average**

$$T_{t+1} = W_1D_1 + W_2D_{t-1} + \ldots + W_nD_{t-n+1}$$

3. **Exponential Smoothing**

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

F_t = new forecast

F_{t-1} = previous forecast

α = smoothing (or weighting) constant ($0 \leq \alpha \geq 1$)

4. Trend Projections

$y = a + bx$

y = computed value of the variable to be predicted

a = y-axis intercept

b = slope of the regression line

x = the independent variable

$$b = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2}$$

$$a = \bar{y} - b\bar{x}$$

5. Exponential Smoothing with Trend Adjustment

$F_t = \alpha (A_{t-1}) + (1- \alpha) (F_{t-1} + T_{t-1})$

$T_t = \beta (F_t - F_{t-1}) + (1-\beta) T_{t-1}$

$FIT_t = F_t + T_t$

Colombo International Nautical and Engineering College

CINEC Campus
Faculty of Management & Social Sciences
Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

Year 3 Semester II

01

SEMESTER END EXAMINATION

Project Management – PMGT0364

- This paper consists of EIGHT questions on EIGHT (08) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- NPV tables are attached to the question paper.

Date: 2017.09.29 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsary)

(a) '*Project management* brings together a set of tools and techniques performed by people to describe, organize, and monitor the work of project activities.'
List down 04 characteristics of a project (04 Marks)

(b) Explain relative advantages and disadvantages of the functional and projectised team approaches to managing projects. (06 Marks)

(c) Let's assume that you have been assigned to a project in which the objectives are to expand three miles of the southern highway by two lanes in each direction. You are in charge of the demolition phase of this project, and you report to the project manager in charge of this project. You have been hired on contract and will be released at the completion of the demolition phase. Explain what type of organisational structure does this represent? (10 Marks)

Question 02

Nestle PLC is considering to purchase of a new machine which would cost USD 40,000. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 20 per cent. Assume the firm uses straight line depreciation and the same is

allowed for tax purposes. The estimated cash flows before depreciation and tax (CFBT) from the compute the following.

Year	CFBT
1	20,000
2	10,692
3	15,000
4	13,462
5	20,385

Required,

(a) Payback period
(b) Average rate of return
(c) NPV at 10% discount rate
(d) Internal rate of return (Consider discount rates as 17% and 18%)
(e) Profitability index at 10% discount rate (5*4 Marks)

Question 03,04, 05 and 06 are based on the case study given below.

CASE STUDY

The "Nanasaviya" is a social service project organised by the students of CINECSA in CINEC Campus, as an extracurricular activity. This offers the students of the Association an excellent opportunity to extend their earnest contribution towards humanity. The purpose of the proposed "Nanasaviya" is primarily to make the students aware of the need to be socially conscious, and to motivate them in taking necessary action where and when appropriate for the welfare of the society. In realisation, the students organise projects to reach out to school going children from deprived regions of the country with the vision of helping them with study materials and moral guidance that they most require during their studies at schools.

This year, the students of CINECSA have identified the some schools as namely Dharma pala Vidyalaya, Moragaha Ulpatha Vidyalaya, Vijaya Vidyalaya, Sri-Jinarathana Pirivena, and Sadakalum Pre School in Vilgamuwa educational division in the Matale as the potential recipients of the "Nanasaviya" benefits. Details of schools are as follows,

- Name of the principal

Name of the School	**Name of the Principal**
DharmapalaVidyalaya	Mrs. Swarna Sirimaanna
MoragahaUlpathaVidyalaya	Mr. W.G Ariyananda
VijayaVidyalaya	Mrs. A.G Mayadunna
Sri JinarathanaPirivena	K.U GnaneeshwaraThero
Sadakalum Pre-school	R.G Thilakawathi

- Name of the contact person : Mr.Vijitha Bandara

- Classes and Students details:

Grade	No: of Boys	No: of Girls	Total
Pre School	9	6	15
Grade 01	30	17	47
Grade 02	15	05	20
Grade 03	25	06	31
Grade 04	10	10	20
Grade 05	11	06	17
Total	100	50	150

The aims of the project

- To provide educational equipment or study material to the students.
- To help improve sports and athletic activities of the school.
- To upgrade learning environment of the students of school.
- To Promote health awareness among school children
- To have local businesses support the school through our promotional campaign.
- To develop our Students attitudes and enhance the cooperation with each other's.

In order to successfully carry out the said project, the organisers seek the at most **Support and Permission of the Management of CINEC Campus**. This request includes the permission to canvass for professional means as well as to obtain **Transport Facilities** to travel to the destination of the days of the project mentioned above.

- **CINEC New Bus for Students and Staff.**

Special Requests of the Schools

School	Description	Unit Price (Rs.) Discounted
DharmapalaVidyalya	36 Chairs and Desks (Plastic)	2,200
Moragaha Ulpatha Vidyalaya	Permanent School Name board	Negotiable
	Needful requirements for Out Door Toilet	NA
Vijaya Vidyalaya		
	Small Book Shelf (Damro)	3,800
	Large Book Shelf (Damro)	10,600
	Cannon Printer	10350
Sri Jinarathana Pirivena	Six (Desk + Bench)	6,000
	Sealing Fan 08 (Sisil)	5,500
	Large Steel Double Door Cupboard (Damro)	14000
	Briliant White (4 * 10 L Cans – Asian Paint)	8,000
	Butter Milk (10* 10 L Cans - Asian Paint)	8,000
Pre School	Cassette Recorder	4,000
	Large Book Shelf (Damro)	10,600
	Small Book Shelf (Damro)	3,800
	Normal Water filter	5,000
	Magazine Folders (20)	200
	Box File (20)	250
	A4 Bundle (25)	440

Other Stationaries (For all Three Schools, Pre School, Pirivena)	Rough Sheet (25)	310
	Card Board File Covers (5*(100 Pack))	450
	Stapler machine (25)	225
	Scissors (30)	85
	Blue Pens (5* 100 pack) / Red Pens (5 * 100 pack) / Black (5* 100 pack)	850
	Marker Pens (10* 12 pack)	540
	White Board Erasers (10)	65
	White Board (5 * (3 feet * 3 feet))	1500
	Refreshments for Kids (150 Students)	100
	Glue Bottle (10)	350
	Rule (50 * 1 feet)	30

- Chief Organizers :

Faculty	Name
Faculty of Management and social sciences	Sasitha Nanayakkara
	Thisun kalana Bandara
Faculty of Engineering and Technology	Dimantha Sanjula
	Chamith Senevirathne
Faculty of Maritime Sciences	Chirath Demtanpitiya
	Dhanushka Dissanayaka
Faculty of Maritime Engineering	L.D De Silva
	R.P Napagoda
IT: Department	Kavindu Hadapanagoda
	Erandi Wanniarachchi
Department of Aviation	Sandeepa Hareshana
	Sandeepa Amithodana
Department of English	Achini Perera
	Amavi Roosarani

- Treasurer : Asel Deesara (Department of Aviation)

Question 03

(a) Develop a priority matrix for the Nenasaviya project. (04 Marks)

(b) Develop a Scope statement for the Nenasaviya project. (16 Marks)

Question 04

(a) Develop Work Breakdown Structure (WBS) for Nenasaviya pproject. Expand at least three "level-one" items to the "level 3"(work package level). (15 Marks)

(b) Code the WBS in part (a) above (05 Marks)

Question 05

(a) Responsibility Matrix summarises the tasks to be accomplished and who is responsible for what on a project.

Construct a responsibility matrix for the Nenasaviya project. (08 Marks)

(b) Having a robust communication plan can go a long way toward mitigating project problems and can ensure that customers, team members, and other stakeholders have the information to do their jobs.

Construct a project communication plan for the Nenasaviya project.

(Identify what information to be communicated, target audience, when, method of communication and information provider) (12 Marks)

01 At

Question 06

(a) Risk management attempts to recognize and manage potential and unforeseen trouble spots that may occur when the project is implemented.

The chances of risk events occurring and their respective costs increasing change over the project life cycle.

Construct a Risk Breakdown Structure for the Nenasaviya pproject

(10 Marks)

(b) Identify Project Management Tools available for below steps of the risk management process. (04 Marks)

(i). Risk Identification

(ii). Risk Assessment

(iii). Risk response development

(iv). Risk response control

(c) Risk management attempts to recognise and manage potential and unforeseen trouble spots that may occur when the project is implemented.

The chances of risk events occurring and their respective costs increasing change over the project life cycle.

Explain what is the significance of this phenomenon to a project manager?

(06 Marks)

Question 07

(a) Draw a project network given the information below. (12 Marks)

Complete the forward and backward pass

Compute activity slack

Identify the critical path.

ID	Description	Predecessor	Time (days)
A	Systems design	None	2
B	Subsystem A design	A	1
C	Subsystem B design	A	2
D	Subsystem C design	A	1
E	Program A	B	2
F	Program B	C	10
G	Program C	D	2
H	Subsystem A test	E	1
I	Subsystem B test	F	1
J	Subsystem C test	G	1
K	Integration	H, I, J	2
L	Integration test	K	1

(a) How sensitive is the network schedule? (03 Marks)

(b) Calculate the free slack and total slack for all noncritical activities. (05 Marks)

Question 08

(a) Explain the difference between avoiding a risk and accepting a risk. (04 Marks)

(b) "Contingency funds are established to cover project risks—identified and unknown."
Explain the differences between budget reserves and the management reserves (04 Marks)

(c) Write FOUR factors influencing the quality of estimates (04 Marks)

(d) Compare Top Down approaches and Bottom up approaches for estimating project time and cost. (04 Marks)

(e) Write TWO Top-down approaches for estimating project time and costs (02 Marks)

(f) Write TWO Bottom up approaches for estimating project time and costs (02 Marks)

----------END OF THE QUESTION PAPER----------

PRESENT VALUE TABLE

Present value of $1, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Cumulative present value of $1 per annum, Receivable or Payable at the end of each year for n years $\frac{1-(1+r)^{-n}}{r}$

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	7.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

FORMULAE

PROBABILITY

$A \cup B$ = ***A* or *B***. $A \cap B$ = ***A* and *B*** (overlap).

$P(B|A)$ = probability of *B*, **given** *A*.

Rules of Addition

If *A* and *B* are mutually exclusive: $P(A \cup B) = P(A) + P(B)$

If *A* and *B* are **not** mutually exclusive: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Rules of Multiplication

If *A* and *B* are *independent*: $P(A \cap B) = P(A) * P(B)$

If *A* and *B* are **not** *independent*: $P(A \cap B) = P(A) * P(B \mid A)$

$E(X) = \Sigma$ (probability * payoff)

DESCRIPTIVE STATISTICS

Arithmetic Mean

$$\bar{x} = \frac{\Sigma x}{n} \qquad \bar{x} = \frac{\Sigma fx}{\Sigma f} \quad \text{(frequency distribution)}$$

Standard Deviation

$$SD = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}} \qquad SD = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \overline{x^2}} \quad \text{(frequency distribution)}$$

INDEX NUMBERS

Price relative = $100 * P_1/P_0$ Quantity relative = $100 * Q_1/Q_0$

Price:
$$\frac{\Sigma w * \left(\frac{P_1}{P_o}\right)}{\Sigma w} \times 100$$

Quantity:
$$\frac{\Sigma w * \left(\frac{Q_1}{Q_o}\right)}{\Sigma w} \times 100$$

TIME SERIES

Additive Model

Series = Trend + Seasonal + Random

Multiplicative Model

Series = Trend * Seasonal * Random

FINANCIAL MATHEMATICS

Compound Interest (Values and Sums)
Future Value S, of a sum of X, invested for n periods, compounded at r% interest

$$S = X[1 + r]^n$$

Annuity
Present value of an annuity of £1 per annum receivable or payable for n years, commencing in one year, discounted at r% per annum:

$$PV = \frac{1}{r}\left[1 - \frac{1}{[1+r]^n}\right]$$

Perpetuity
Present value of £1 per annum, payable or receivable in perpetuity, commencing in one year, discounted at r% per annum:

$$PV = \frac{1}{r}$$

LEARNING CURVE

$$Y_x = aX^b$$

where:
Y_x = the cumulative average time per unit to produce X units;
a = the time required to produce the first unit of output;
X = the cumulative number of units;
b = the index of learning.

The exponent b is defined as the log of the learning curve improvement rate divided by log 2.

INVENTORY MANAGEMENT

Economic Order Quantity

$$EOQ = \sqrt{\frac{2C_oD}{C_h}}$$

where: C_o = cost of placing an order
C_h = cost of holding one unit in Inventory for one year
D = annual demand

Colombo International Nautical and Engineering College

CINEC Campus
Faculty of Management & Social Sciences
Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

Year 3 Semester II

SEMESTER END EXAMINATION

Port Planning – PLUT0250

- This paper consists of EIGHT questions on TWO (02) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.09.27 Pass mark: 50% Time: 03 Hours

Question 01: (Compulsory)

Compare Colombo South Harbour Port Project Planning with **one** of the following?
(a) South Korean Ports.
(b) Vallapadam International Transhipment Container Terminal in Kerala State in India
(c) Vizinjam International Transhipment Container Terminal in Kerala State.
(d) Enayam International Transhipment Container Terminal building in Tamil

(20 Marks)

Question 02

What is your opinion to hand over the entire management of the Port of Hambantota to Chinese for 99 years and best port layout port master plan for Hambantota Port?

(20 Marks)

Question 03

"There is a trend that Global Port/Terminal Operators and Shipping Lines invest and operate Container terminals" discuss with examples?

(20 Marks)

Question 04

What are the advanced navigational facilities that can be considered to use in a new port navigational facility planning? (20 Marks)

Question 05

"Some new sea ports are building towards the land and others towards the sea" Why and discuss with examples? (20 Marks)

Question 06

What equipment mix & the terminal layout you propose for the East Container Terminal? (20 Marks)

Question 07

What are the special factors that a Port Consultant should consider when modernizing existing facilities, new capacity building and green field port planning? (20 Marks)

Question 08

Select **one** of the terminals, draw a layout plan and select best facilities / equipment's?

(a) RO-RO Terminal

(b) Container Terminal

(c) Automated Container Terminal

(d) Cruise Terminal (20 Marks)

----------END OF THE QUESTION PAPER----------

Colombo International Nautical and Engineering College

CINEC Campus
Faculty of Management & Social Sciences
Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

Year 3 Semester II

SEMESTER END EXAMINATION

Customs and Commodity Inspections Operations – CCIO0234

- This paper consists of EIGHT questions on FOUR (04) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Required supporting documents are attached to the question paper.

Date: 2017.09.19 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

Euro International Group is a multinational company based in The Netherlands and the rights holder of several world-renowned brands including "Clarity" and "Bee" brands.

Great Wall Ltd is a Pencil manufacturing company based in China. They manufacture "Clarity" brand Pencils according to the specified quality of Euro International Group and supply the same only to the buyers nominated by Euro International Group. Euro International Group holds 43% of shares of Great Wall Ltd and several Directors of Great Wall Ltd are also Directors of Euro International Group.

Euro Lanka Ltd is a Sri Lankan trading company registered under the Companies Act. However, Euro International Group holds 48% of shares of Euro Lanka Ltd. Several Directors including the Managing Director of Euro Lanka Ltd are also Directors of Euro International Group. Euro Lanka Ltd has been appointed by Euro International as their Sole-Agent in Sri Lanka for the sale of "Clarity" brand Pencils. In addition to the Sole-Agency Agreement Euro Lanka Ltd has also entered into an agreement with Euro International Group termed as Royalty Agreement. According to this Royalty Agreement, Euro Lanka has to pay 7.5% of the Ex-Work price as Royalty to Euro International Group for the "Clarity" brand Pencils purchased from Great Wall Ltd.

Euro Lanka has imported a shipment of 01x20' container said to contain 500,000 dozen of "Clarity" brand Pencils from Great Wall Ltd. The Ex-Work price agreed is USD 0.012

per pencil. Euro Lanka has entrusted the transportation of the said container from China to the Port of Colombo to a Freight Forwarding company namely Sea-Sky Lanka Ltd. They have issued a quotation containing the following charges.

Charges at Origin

1. Sea Freight - USD 1285
2. Packing Cost - USD 315
3. Inland Transport - USD 725
4. Handling Charges - USD 165

Charges at Destination

1. Terminal Handling (THC) - USD 250
2. Container Deposit - Rs. 5750
3. Container Washing - Rs. 1150

The marine insurance has been obtained locally from Sri Lanka Insurance Company on payment of Rs. 15,452/= for the whole shipment.

The Commercial Invoice submitted to Sri Lanka Customs for the clearance of the said shipment indicated CIF price as USD 7,385. The Customs Officers rejected this value and move to calculate the correct CIF value. Presume that you are the Customs Officer who was entrusted with this task and calculate the Customs Value of the subject shipment in Sri Lankan Rupees. The Exchange Rate is provided in the attached sheet.

(20 Marks)

Question 02

Excel (Pvt) Ltd has imported a consignment of 21 units of Brand New Refrigerator-Freezers from Malaysia. The price paid is CIF Colombo USD 1,545 per unit. According to the Sri Lanka Tariff Guide 2017 the Combined Refrigerator-Freezers, fitted with separate external doors (unused) is classified within HS Code 8418.10.90 and the following taxes are payable for the importation.

1. Customs Duty - 15%
2. VAT - 15%
3. PAL - 7.5%
4. NBT - 2%
5. Cess - 15% or Rs. 18,000 per unit
6. Excise (SP) Duty - 17%

Calculate all six taxes payable for the above shipment. Exchange Rates and Formulas are provided in the attached documents to this question paper.

(20 Marks)

Question 03

Explain the following sections and schedules of the Customs Ordinance. 78

(a) Section 10 and Schedule A (10 Marks)
(b) Section 12 and Schedule B (10 Marks)

Question 04

Describe the functions of the Sri Lanka Customs and legislative framework related to such functions. (20 Marks)

Question 05

(a) Name the **six methods** given in the WTO Valuation Agreement to determine the Customs Value. (06 Marks)

(b) Explain in detail the **Article 1** and the **Article 8** of the **Schedule E** of the Customs Ordinance of Sri Lanka. (14 Marks)

Question 06

Explain in detail the first three General Interpretative Rules (GIR) for the interpretation of Harmonized System with suitable examples.

(20 Marks)

Question 07

(a) Write a short essay about the World Customs Organisation (WCO). (06 Marks)

(b) Explain in the structuer of a HS Code upto 6 digits and the proceedure one should follow to determin the HS Code of any given commodity. (14 Marks)

Question 08

Write short essays on **FOUR (04)** of the following topics. (20 Marks)

(a) Customs Ordinance

(b) Imports and Exports (Control) Act

(c) Exchange Control Act

(d) Poison, Opium and Dangerous Drugs Act

(e) Fauna and Flora Protection Act

(f) Payment Methods

(g) Value Added Tax Act

----------END OF THE QUESTION PAPER----------

Computation formulae for imported goods

Where

v	=	CIF value in Rupee
c	=	Cess levy under Sri Lanka Export Development Act
d	=	Customs Duty
e	=	Excise (Special Provisions) Duty (ED)
t	=	Value Added Tax (VAT)
n	=	Nation Building Tax
p	=	Port and Airport Development Levy (PAL)
r_e	=	Rate of Excise (Special Provisions) Duty (ED)
r_t	=	Rate of Value Added Tax (VAT)
r_n	=	Rate of Nation Building Tax

- Customs Duty (d) = (CIF value) × (Customs duty rate)
  or
  = (quantity) × (unit rate of customs duty)

- Value Added Tax (t) = (v + 10% of v + d + c + p + e) × r_t

- Cess Levy (c) = (v + 10% of v) × (Cess levy rate)
  or
  = (quantity) × (unit rate of Cess levy)

- Port and Airport Development Levy (p) = (CIF value) × (PAL rate)

- Excise (Special Provisions) Duty (e) = (v + 15% of v+ d + c + p) × r_e
  or
  = (quantity) × (unit rate of Excise Duty)

- Special Commodity Levy = (Quantity) × (unit rate of Special Commodity Levy)

- Nation Building Tax (n) = (v +10%v + d + c + p + e) r_n

Schedule

Rates of Exchange Effective From 11.09.2017 to 17.09.2017

	Country	Country Code	Currency	Currency Code	Rate of Exchange (Rs.)
1	Australia	AU	Dollar	AUD	124.9371
2	Bahrain	BH	Dinar	BHD	409.7639
3	Bangladesh	BD	Taka	BDT	1.8937
4	Brazil	BR	Brazil Real	BRL	49.8572
5	Brunei	BN	Brunei Dollar	BND	115.4685
6	Canada	CA	Canadian Dollar	CAD	127.8186
7	China	CN	Renminbi	CNY	23.9034
8	China	CN	Offshore	CNH	23.8910
9	Czechoslovakia	CZ	Koruna	CZK	7.1253
10	Denmark	DK	Kroner	DKK	25.0220
11	Egypt	EG	Pound	EGP	8.7596
12	Euro Zone		Euro	EUR	186.1810
13	Ghana	GH	Cedi	GHS	34.8803
14	Hongkong	HK	Dollar	HKD	19.8071
15	Hungary	HU	Forint	HUF	0.6087
16	India	IN	Rupee	INR	2.4138
17	Indonesia	ID	Rupiah	IDR	0.0116
18	Iran	IR	Riyal	IRR	0.0046
19	Japan	JP	Yen	JPY	1.4276
20	Jordan	JO	Dinar	JOD	217.9406
21	Korea	KR	Won	KRW	0.1369
22	Kuwait	KW	Dinar	KWD	512.5973
23	Macau	MO	Pataca	MOP	19.1688
24	Malaysia	MY	Ringgit	MYR	36.9223
25	Maldives	MV	Rufiya	MVR	9.9434
26	Mauritius	MU	Rupee	MUR	4.6612
27	Myanmar	MM	Kyat	MMK	0.1137
28	Nepal	NP	Rupee	NPR	1.5078
29	New Zealand	NZ	Dollar	NZD	112.6450
30	Nigeria	NG	Naira	NGN	0.5062
31	Norway	NO	Kroner	NOK	20.0173
32	Oman	OM	Riyal	OMR	401.3660
33	Pakistan	PK	Rupee	PKR	1.4667
34	Papua New Guinea	PG	Kina	PGK	48.2875
35	Philippines	PH	Peso	PHP	3.0464
36	Poland	PL	Zloty	PLN	43.7926
37	Qatar	QA	Riyal	QAR	41.7909
38	Russia	RU	Rouble	RUB	2.7135
39	Saudi Arabia	SA	Riyal	SAR	41.2031
40	Seychelles	SC	Rupee	SCR	11.4906
41	Singapore	SG	Dollar	SGD	115.4469
42	South Africa	ZA	Rand	ZAR	12.0759
43	Sweden	SE	Krona	SEK	19.5315
44	Switzerland	CH	Francs	CHF	163.3403
45	Taiwan	TW	Dollar	TWD	5.1596
46	Thailand	TH	Baht	THB	4.6725
47	U.A.E.	AE	Dirham	AED	42.0691
48	United Kingdom	GB	Sterling Pound	GBP	202.8074
49	United States of America	US	Dollar	USD	154.5199
50	Zambia (Old)	ZM	Kwacha	ZMK	0.0297
51	Zambia (New)	ZM	Kwacha	ZMW	16.9048
52	Zimbabwe	ZW	Dollar	ZWD	0.4072

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Year 3 Semester II

SEMESTER END EXAMINATION

Operational Research – ORSH0372

- This paper consists of EIGHT questions on SIX (06) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.09.25 Pass mark: 50% Time: 03 Hours

Question 01 and Question 02 are based on the case study given below.

CASE STUDY

A local travel agent is planning a charter trip to a major sea port. The eight day and seven night package includes the fare for round trip, surface transportation, board and lodging and selected tour options.

- The charter trip includes 200 persons in total.
- The problem for the travel agent is to determine the number of
  - Deluxe
  - Standard
  - Economy tour packages to offer for this charter.
- These three plans are differ according to seating and service for flight, quality of accommodations, meal plans and tour options.
- Table 1.01 summarises the estimated prices for the three packages and the corresponding expenses for the travel agent
- The travel agent has to pay flat fee of USD 200,000.00 for the entire trip.
- In planning the trip, the following considerations must be taken into account:
  - At least 10% of the package must be of the deluxe type

- At least 35% but not more than 70% must be of the standard type
- At least 30% must be of the economic type
- The maximum number of deluxe packages available in the aircraft is restricted to 60.
- The hotel desire at least 120 of the tourists should be on deluxe and standard packages taken together.

Table 1.01

Tour Plan	Price of the selected plan USD	Hotel cost USD	Meal and other expenses USD	Revenue from the package USD
Deluxe	10,000	3,000	4,750	2,250
Standard	7,000	2,200	2,500	2,300
Economy	6,500	1,900	2,200	2,400

The travel agent wishes to determine the number of packages to offer in each type so as to maximise the total profit.

(Assume that Total profit = total revenue from all packages - flat fee for aircraft)

Question 01: (Compulsory)

Read the case study given and formulate that as a Linear Programming model to determine the number of deluxe, standard and economic packages to offer to maximise the profit of the travel agent. (20 Marks)

Question 02

Using the LP model formulated in Question 01, Find the optimal solution to the above scenario using Graphical method. (20 Marks)

Question 03

Using Simplex method, find the optimal solution to the LP model given below.

Max Z = 5X1+10X2+8X3

Subject to

3X1+5X2+2X3 ≤60

4X1+4X2+4X3≤72

2X1+4X2+5X3≤100

X1, X2, X3≥0

(20 Marks)

Question 04

Using Two-Phase method, find the optimal solution to the LP model given below.

Minimise Z = 40X1 + 24X2

Subject to

20X1 + 50X2 ≥ 4800

80X1 + 50X2 ≥7200

X1, X2≥0

(20 Marks)

Question 05

Find the dual of the LP model (primal problem) given below.

Minimize Z = 6X1 + 4X2

Subject to the constraints

4X1 + X2 ≥ 2

3X1 +2X2 ≥3

X1 + 5X2 ≥ 1

X1, X2 ≥0

Solve the primal problem using Dual Simplex criteria and hence obtain the solution of the dual problem.

(20 Marks)

Question 06

A manufacturer has 03 distribution centers at Colombo, Galle and Gampaha. These centers have availability of 40, 20 and 40 units supplyrespectively. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units respectively. Unit trasnportation cost is given in Table 6.01 given below.

Table 6.01

	A	B	C	D	E	Supply
Colombo	55	30	40	50	40	40
Galle	35	30	100	45	60	20
Gampaha	40	60	95	35	30	40
Demand	25	10	20	30	15	

(a) Find the initial transportation schedule using *North West Corner Method.* (05 Marks)

(b) Find the optimum transportation schedule using *Method of Multipliers (U-V Method).* (15 Marks)

Question 07

Dr. Jayasinghe is a dentist who schedules all his patients for 30-minutes appoinments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the variouscategories of work, tehir probabilities and the time actually needed to complete the work.

Table 7.01

CATEGORY	TIME REQUIRED	PROBABILITY OF THE CATEGORY
Filling	45 minutes	0.40
Crown	60 minutes	0.15
Cleaning	15 minutes	0.15
Extraction	45 minutes	0.10
Check-up	15 minutes	0.20

Simulate the dentist's clinic for **FOUR** hours and determine average waiting time for the patients as well as the idleness of the doctor.

Assume that all patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use below random numbers for simulation run.

40 82 11 34 25 66 17 79

(20 Marks)

Question 08

BestDairy produces four types of milk powder packets P1, P2, P3 and P4 using three kinds of raw materials R1, R2 and R3. The amounts of raw materials used to produce one unit of each type of milk powder packet, availability of raw materials and resulting profits are as follows.

Table 8.01

	R1	R2	R3	Profit (USD/unit)
P1	3	1	4	19
P2	2	1	3	13
P3	1	1	3	12
P4	1	1	4	17
Availability	225	117	420	

Consider the final feasible tableau given below.

Basis	Z	X1	X2	X3	X4	S1	S2	S3	Value
Z	1	0	1	0	0	2	1	3	1827
X4	0	0	-1	0	1	-1	-5	2	30
X3	0	0	1	1	0	0	4	-1	48
X1	0	1	1	0	0	1	2	-1	39

(a) Convert the optimum tableau into equations and write equations for Z, X_4, X_3 and X_1. (08 Marks)

(b) If BestDairy produces a new "Hi-Cal" Milk powder type, which requires

- 3 units of R1
- 1 unit of R2 and
- 2 units of R3
- Gives USD 14 profit.

Find the optimum solution. (12 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Airport Planning and Management – APMG0353

- This paper consists of EIGHT questions on THREE (03) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly

Date: 2017.09.23 Pass mark: 50% Time: 03 Hours

Question 01: (Compulsory)

(a) What are the services and facilities available in an airport (05 Marks)
(b) List down three factors that contribute towards delay in an airport (05 Marks)
(c) Explain what is airside and landside in an airport in detail (10 Marks)

Question 02

(a) Explain the difference between private and state owned airports in terms of the ownership type. In your view what type of an ownership style is more suitable for a Mattala Rajapaksha International Airport? (15 Marks)
(b) Define delay and capacity (05 Marks)

Question 03

(a) There are different types of runways based on the markings that exist. These markings are decided based on the navigational aids that are available in the airport. Explain these different types of runways based on the markings with graphical illustrations. (15 Marks)

(b) Identify 5 different planning studies that are undertaken when planning airport infrastructure (05 Marks)

Question 04

(a) Explain four types of airport terminal configurations with the use of appropriate graphical illustrations to support your answer. (10 Marks)

(b) Explain the how the pilots make use of PAPIs and VASIs when approaching to land in an airport. You may use graphical illustrations to support your answer. (10 Marks)

Question 05

(a) What is meant by FIR? List down three FIRs that are adjoining to the Colombo FIR. (05 marks)

(b) What are safety inspection programmes in the context of an airport? Who conducts these safety inspections and what are the areas covered through these inspections in an aerodrome. (05 Marks)

(c) Discuss the pros and cons of trusted traveler programme and computer assisted passenger -screening system (10 marks)

Question 06

(a) Aviation is a system that is vulnerable to security threats with the changing environment of the industry. In this context security is one of the important aspects that require careful implementation of means and methods to provide security at commercial airports? Explain four of these methods in detail. (10 Marks)

(b) Explain four components of airport master planning in brief. (10 Marks)

Question 07

(a) Explain what are aeronautical and non-aeronautical revenue sources in the context of an airport (05 Marks)

(b) List down four aeronautical and non-aeronautical income sources (05 Marks)

(c) Airports play different roles other than its day-to-day operations that take place. Among these are the environmental role, economic role and the social role that an airport fulfill. Considering Bandaranaike International Airport explain its economic role in detail with examples. (10 Marks)

Question 08

(a) Similar to runway markings and lighting there are different types of signs that are installed in airfields in order to provide more precise and accurate information for pilots to navigate the aircraft in the airfield. These signs fall into different categories. Identify two main categories and two signs each for the categories identified by you with graphical illustration with correct color coding. (10 Marks)

(b) Explain two different types of navigational aids that are used by airport operators to provide more accurate information to pilots when navigating the aircraft. (10 Marks)

----------END OF THE QUESTION PAPER----------

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Year 3 Semester II

SEMESTER END EXAMINATION

Econometrics – ECON0321

- This paper consists of EIGHT questions on TWELVE (12) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly
- Required supporting documents are attached to the question paper.

Date: 2017.09.21 Pass mark: 50% Time: 03 Hours

Question 01 (Compulsory)

"Econometrics consists of the applications of mathematical statistics to economic data to lend empirical support to the models constructed in mathematical economics.

(a) Describe the traditional econometric methodology with an example (08 Marks)

(b) What is the difference between theoretical econometrics and applied econometrics? (04 Marks)

(c) Why Stationary time series data should be applied in econometrics studies? (04 Marks)

(d) What is meant by internal consistency? (04 Marks)

Question 02

(a) A manufacturing company says that the productivity of employees is 60 items per hour. Ten employees have been selected into the study and the number of items they produced per hour was measured. Information is provided by the following table.

60	60	59		59	58	60	59	61	58	61

(i) Test the statement of the company. (04 Marks)

(ii) Estimate the confidence interval of the difference. (04 Marks)

(b) You need to test whether there is a difference between the two financial institutions in relation to leasing facilities. Selecting ten customers from each institution, a questionnaire was given to answer. Each answer has been assigned some marks and the total mark is 50. Following table provides the marks given by each customer. Test and interpret the results.

Institution 1	40	42	41	39	38	42	37	39	39	40
Institution 2	43	37	39	41	37	39	40	38	41	38

(12 Marks)

Question 03

(a) Machine operators (MO) of a garment factory have been trained to improve their productivity. Number of items they produced per hour has been counted within the two periods. Pre results represent the number of items they produced before the training program and after the training represent post results. The results of productivities are provided below. Test whether there is a significant improvement in machine operators from training program.

Table 3.01

MO	Pre results	Post results	MO	Pre results	Post results
1	23	27	11	19	20
2	26	30	12	21	20
3	21	22	13	21	23
4	27	29	14	24	21
5	26	21	15	23	23
6	29	29	16	25	29
7	22	20	17	17	23
8	26	28	18	27	30
9	28	24	19	20	24
10	23	25	20	22	21

(10 Marks)

(b) Four companies which produce food item say that their products are equal in quality. You need to test this statement and collected data with regard to vitamin content. Information is provided by the following table. Construct one way ANOVA and test the statement.

Table 3.02

Company A (Mg)	Company B (Mg)	Company C (Mg)	Company D (Mg)
10	8	10	13
14	10	11	14
13	9	12	10
12	3	12	11
12	8	14	12
11	10	13	12

(10 Marks)

Question 04

Management of a company is expecting to construct a model to forecast sales income with regard to price of the product and other price of the competitors. Table below provides information for a period of five years and equation provides regression model.

Table 4.01

Sales income (Rs. Millions)	**Price (Rs)**	**Other price (Rs)**
20	8	5
50	6	8
40	7	6
60	5	9
70	3	10

$$Sales\ Income = 8.1 - 2.3\ Price + 7.01\ Other\ price + \varepsilon - - - -Equation$$

(a) Construct Regression ANOVA table and interpret the results. (05 Marks)

(b) Calculate R-square, Adjusted R-square and take the decision. (05 Marks)

(c) Test the Auto correlation by using Durbin-Watson test statistics. (05 Marks)

(d) It is expected to determine the normality of residuals in the regression model. Coefficients of Skewness and Kurtosis for residuals are 0.771 and 1.921 respectively. Calculate Jarque-Bera test statistics and take the decision.

(05 Marks)

Question 05

(a) What is the condition to use Restricted and Unrestricted VAR in econometrics studies?

(02 Marks)

(b) What are the advantages and critics of VAR models? (06 Marks)

(c) Interpret the following Augmented Dickey Fuller unit root test results.

Table 5.01

Variables	**Probability at level**	**Probability at first difference**
GDP	0.4095	0.000
Domestic Debt (DD)	0.529	0.000
Money supply (M))	0.304	0.000
Exchange Rate (ER)	0.656	0.013

(02 Marks)

(d) A researcher has carried out Lag length criterion and Johansen test of cointegration to construct Vector Error Correction Model (VECM) for the above variables. Advise the researcher using following test results.

VAR Lag Order Selection Criteria

Endogenous variables: GDP DD M ER

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-375.0981	NA	111771.2	22.97564	23.15704	23.03668
1	-164.3427	357.6456	0.843816	11.17228	12.07926*	11.47745*
2	-152.9286	16.60231	1.168070	11.45022	13.08277	11.99952
3	-128.1870	29.98981*	0.778050*	10.92042*	13.27856	11.71386

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.680013	72.19233	47.85613	0.0001
At most 1 *	0.454941	35.72918	29.79707	0.0092
At most 2 *	0.398703	16.30964	15.49471	0.0376
At most 3	0.001009	0.032316	3.841466	0.8573

(04 Marks)

(e) What is meant by Speed of Adjustment in VECM? (02 Marks)

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(f) Interpret the following VECM results.

Dependent Variable: D(GDP)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.582624	0.259620	-2.244145	0.0393
C(2)	0.250854	0.135236	1.854941	0.0821
C(3)	0.198529	0.063052	3.148639	0.0062
C(4)	0.319841	0.180720	1.769815	0.0958
C(5)	0.034285	0.177651	0.192988	0.8494
C(6)	0.254077	0.151937	1.672244	0.1139
C(7)	-0.096492	0.148709	-0.648865	0.5256
C(8)	0.147769	0.162885	0.907196	0.3778
C(9)	0.061271	0.126894	0.482854	0.6357
C(10)	-0.040151	0.218625	-0.183653	0.8566
C(11)	-0.399007	0.182815	-2.182565	0.0443
C(12)	0.063040	0.209277	0.301226	0.7671
C(13)	3.61E-06	2.90E-06	1.247008	0.2303
C(14)	-2.98E-06	1.94E-06	-1.539036	0.1433
C(15)	1.16E-06	2.05E-06	0.566739	0.5788
C(16)	0.084719	0.129104	0.656207	0.5210

R-squared	0.749128	Mean dependent var	0.137969
Adjusted R-squared	0.513935	S.D. dependent var	0.050610
S.E. of regression	0.035285	Akaike info criterion	-3.543876
Sum squared resid	0.019920	Schwarz criterion	-2.811008
Log likelihood	72.70201	Hannan-Quinn criter.	-3.300951
F-statistic	3.185165	Durbin-Watson stat	2.311027
Prob(F-statistic)	0.013774		

(04 Marks)

Question 06

(a) Explain the volatility clustering of economic and financial data. (05 Marks)

(b) Why do you use Mean and Variance equations in ARCH family models? (04 Marks)

(c) A study has been conducted to examine the volatility clustering of domestic debt in Sri Lanka. ARCH test for residuals is provided below.

Heteroskedasticity Test: ARCH

F-statistic	536.0274	Prob. F(1,33)	0.0000
Obs*R-squared	32.97022	Prob. Chi-Square(1)	0.0000

What would be your decision about debt? (03 Marks)

(d) Following tables provide the results of ARCH and GARCH models. Select the appropriate model and interpret the results.

Dependent Variable: DD

GARCH = C(2) + C(3)*RESID(-1)^2

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	12.66070	0.146756	86.27031	0.0000
	Variance Equation			
C	0.020386	0.084108	0.242379	0.8085
RESID(-1)^2	1.005372	1.548243	0.649363	0.5161

R-squared	-0.013831	Mean dependent var	12.47242
Adjusted R-squared	-0.075275	S.D. dependent var	1.623631
S.E. of regression	1.683632	Akaike info criterion	3.242472
Sum squared resid	93.54236	Schwarz criterion	3.374431
Log likelihood	-55.36449	Hannan-Quinn criter.	3.288529
Durbin-Watson stat	0.010606		

Dependent Variable: DD

GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	12.43883	0.176798	70.35625	0.0000
Variance Equation				
C	0.032548	0.160931	0.202245	0.8397
RESID(-1)^2	1.549310	2.082463	0.743980	0.4569
GARCH(-1)	-0.478214	2.532201	-0.188853	0.8502

R-squared	-0.000440	Mean dependent var	12.47242
Adjusted R-squared	-0.094231	S.D. dependent var	1.623631
S.E. of regression	1.698408	Akaike info criterion	3.160826
Sum squared resid	92.30685	Schwarz criterion	3.336772
Log likelihood	-52.89486	Hannan-Quinn criter.	3.222236
Durbin-Watson stat	0.010748		

(04 Marks)

(e) What is your decision according to Heteroskedasticity Test results?

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.908183	Prob. F(3,26)	0.0198
Obs*R-squared	9.323809	Prob. Chi-Square(3)	0.0253
Scaled explained SS	10.06862	Prob. Chi-Square(3)	0.0180

(02 Marks)

(f)Interpret the following Breusch-Godfrey Serial Correlation LM Test.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.318990	Prob. F(2,24)	0.2861
Obs*R-squared	2.970923	Prob. Chi-Square(2)	0.2264

(02 Marks)

Question 07

"Effect of categorical data can be determined by constructing dummy variables regression models to obtain numerical results".

(a) Why do you use dummy variables in econometrics models?. (03 Marks)

(b) What is meant by "Dummy variable trap"? (03 Marks)

(c) Ten industries which apply one of three Financial Modelling (FM) are named as FM-1, FM-2 and FM-3. Following information is provided.

Industry	Financial growth	MP
1	11	FM-1
2	12	FM -2
3	10	FM -1
4	9	FM -3
5	11	FM -2
6	8	FM -3
7	10	FM -3

8	12	FM -1
9	9	FM -3
10	10	FM -2

Construct dummy linear regression model comprising intercept to study the effect of Financial Modeling on financial growth. (05 Marks)

(d) Briefly explain Logistic Regression model (02 Marks)

(e) A researcher expects to study the financial stability of a person according to their educational level. Variables have been coded as High financial stability 1, Low financial stability 0 and Higher education 1, otherwise 0. Logit model provides the following estimated results.

Dependent Variable: Financial stability

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Education	1.469	.314	21.908	1	.000	4.345
	Constant	-1.211	.215	31.643	1	.000	.298

a. Variable(s) entered on step 1: Education.

(i) Construct Logistic regression model (02 Marks)

(ii) Calculate probabilities of high financial stability if a selected person has higher educational qualification. (05 Marks)

Question 08

Write short notes on followings.

(a) Multicollinearity

(b) Cholesky dof adjusted method

(c) Durbin Watson test statistics

(d) Serial Correlation

(e) Heteroscedasticity (20 Marks)

----------END OF THE QUESTION PAPER----------

Formula sheet

$$Mean = \frac{\sum x}{n} \qquad Variance = \frac{\sum (x-\bar{x})^2}{n-1}$$

$$\propto = \frac{rk}{1+(k-1)r} \qquad JB = n\left(\frac{s^2}{6} + \frac{(k-3)^2}{24}\right)$$

$$(\bar{x}_1 - \bar{x}_2) \pm z_{\frac{\propto}{2}} SE$$

$$SE = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \qquad SE = SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$SP = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

$$TS = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} \qquad TS = \frac{p - p_0}{\sqrt{\frac{p_0 q_o}{n}}}$$

$$TS = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$TS = \frac{\bar{x}_1 - \bar{x}_2}{SP\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$TS = \frac{p_1 - p_2}{\sqrt{\frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}}}$$

$$\chi^2 = \sum \frac{(o-e)^2}{e}$$

$$Coefficient\ of\ Correlation = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Normal Equations

$$Y = a + b_1 x_1 + b_2 x_2$$

$$\sum y = na + b_1 \sum x_1 + b_2 \sum x_2$$

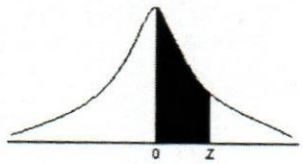
$$\sum x_1 y = a \sum x_1 + b_1 \sum x_1^2 + b_2 \sum x_1 x_2$$

$$\sum x_2 y = a \sum x_2 + b_1 \sum x_1 x_2 + b_2 \sum x_2^2$$

$$Sum\ of\ Square\ of\ Regression = \sum (\hat{Y} - \bar{Y})^2$$

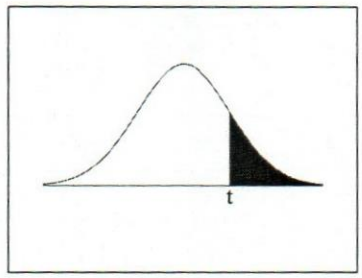
$$Sum\ of\ Square\ of\ Residual = \sum (Y - \hat{Y})^2$$

$$Sum\ of\ Square\ of\ Total = \sum (Y - \bar{Y})^2$$



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49896	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983

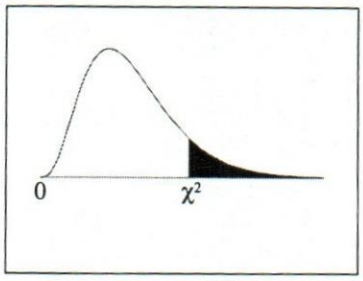
t-Distribution Table



The shaded area is equal to α for $t = t_\alpha$.

df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
32	1.309	1.694	2.037	2.449	2.738
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.434	2.719
38	1.304	1.686	2.024	2.429	2.712
∞	1.282	1.645	1.960	2.326	2.576

Chi-Square Distribution Table



The shaded area is equal to α for $\chi^2 = \chi^2_\alpha$.

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
51	4.030	3.179	2.786	2.553	2.397	2.283	2.195	2.126	2.069	2.022
52	4.027	3.175	2.783	2.550	2.393	2.279	2.192	2.122	2.066	2.018
53	4.023	3.172	2.779	2.546	2.389	2.275	2.188	2.119	2.062	2.015
54	4.020	3.168	2.776	2.543	2.386	2.272	2.185	2.115	2.059	2.011
55	4.016	3.165	2.773	2.540	2.383	2.269	2.181	2.112	2.055	2.008
56	4.013	3.162	2.769	2.537	2.380	2.266	2.178	2.109	2.052	2.005
57	4.010	3.159	2.766	2.534	2.377	2.263	2.175	2.106	2.049	2.001
58	4.007	3.156	2.764	2.531	2.374	2.260	2.172	2.103	2.046	1.998
59	4.004	3.153	2.761	2.528	2.371	2.257	2.169	2.100	2.043	1.995
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993
61	3.998	3.148	2.755	2.523	2.366	2.251	2.164	2.094	2.037	1.990
62	3.996	3.145	2.753	2.520	2.363	2.249	2.161	2.092	2.035	1.987
63	3.993	3.143	2.751	2.518	2.361	2.246	2.159	2.089	2.032	1.985
64	3.991	3.140	2.748	2.515	2.358	2.244	2.156	2.087	2.030	1.982
65	3.989	3.138	2.746	2.513	2.356	2.242	2.154	2.084	2.027	1.980
66	3.986	3.136	2.744	2.511	2.354	2.239	2.152	2.082	2.025	1.977
67	3.984	3.134	2.742	2.509	2.352	2.237	2.150	2.080	2.023	1.975
68	3.982	3.132	2.740	2.507	2.350	2.235	2.148	2.078	2.021	1.973
69	3.980	3.130	2.737	2.505	2.348	2.233	2.145	2.076	2.019	1.971
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969
71	3.976	3.126	2.734	2.501	2.344	2.229	2.142	2.072	2.015	1.967
72	3.974	3.124	2.732	2.499	2.342	2.227	2.140	2.070	2.013	1.965
73	3.972	3.122	2.730	2.497	2.340	2.226	2.138	2.068	2.011	1.963
74	3.970	3.120	2.728	2.495	2.338	2.224	2.136	2.066	2.009	1.961
75	3.968	3.119	2.727	2.494	2.337	2.222	2.134	2.064	2.007	1.959
76	3.967	3.117	2.725	2.492	2.335	2.220	2.133	2.063	2.006	1.958
77	3.965	3.115	2.723	2.490	2.333	2.219	2.131	2.061	2.004	1.956
78	3.963	3.114	2.722	2.489	2.332	2.217	2.129	2.059	2.002	1.954
79	3.962	3.112	2.720	2.487	2.330	2.216	2.128	2.058	2.001	1.953
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951
81	3.959	3.109	2.717	2.484	2.327	2.213	2.125	2.055	1.998	1.950
82	3.957	3.108	2.716	2.483	2.326	2.211	2.123	2.053	1.996	1.948
83	3.956	3.107	2.715	2.482	2.324	2.210	2.122	2.052	1.995	1.947
84	3.955	3.105	2.713	2.480	2.323	2.209	2.121	2.051	1.993	1.945
85	3.953	3.104	2.712	2.479	2.322	2.207	2.119	2.049	1.992	1.944
86	3.952	3.103	2.711	2.478	2.321	2.206	2.118	2.048	1.991	1.943
87	3.951	3.101	2.709	2.476	2.319	2.205	2.117	2.047	1.989	1.941
88	3.949	3.100	2.708	2.475	2.318	2.203	2.115	2.045	1.988	1.940
89	3.948	3.099	2.707	2.474	2.317	2.202	2.114	2.044	1.987	1.939
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938
91	3.946	3.097	2.705	2.472	2.315	2.200	2.112	2.042	1.984	1.936
92	3.945	3.095	2.704	2.471	2.313	2.199	2.111	2.041	1.983	1.935
93	3.943	3.094	2.703	2.470	2.312	2.198	2.110	2.040	1.982	1.934
94	3.942	3.093	2.701	2.469	2.311	2.197	2.109	2.038	1.981	1.933
95	3.941	3.092	2.700	2.467	2.310	2.196	2.108	2.037	1.980	1.932
96	3.940	3.091	2.699	2.466	2.309	2.195	2.106	2.036	1.979	1.931
97	3.939	3.090	2.698	2.465	2.308	2.194	2.105	2.035	1.978	1.930
98	3.938	3.089	2.697	2.465	2.307	2.193	2.104	2.034	1.977	1.929
99	3.937	3.088	2.696	2.464	2.306	2.192	2.103	2.033	1.976	1.928
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927