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*PAST PAPERS*

| *Faculty* | *Department / Section/Division* |
|---|---|
| *Not Applicable* | *Learning Resource Centre* |

# Past Papers

## Faculty of Humanities & social Sciences
## Department of Logistics & Transportation

# Bsc.(Hons) Logistic & Transportation
# (Year 4 – Semester I)
# 2016 - 2022

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Faculty of Management and Social Sciences
Department of Logistics & Transport
BSc Hons in Logistics and Transportation
Course CODE: COM551

Year 4 Semester I

SEMESTER END EXAMINATION

Modelling in Transport and Logistics – LTML4202

- This paper consists of SEVEN (07) questions on FIVE (05) pages.
- Answer FOUR (04) 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: 2022.09.24 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

(a) State the four types of travel movement and briefly describe each with an example with graphical representation. (04 Marks)

There are three transport zones (Zi) named A, B and C. The following table gives the residential and employed population, number of households, industrial jobs and other jobs in each of these zones. Equations to calculate trip generation (Tgi) and attraction (Tai) are as follows:

$$Tgi = (1.5\times RPi) + (2.5\times EPi)$$
$$Tai = HHi + 2.22 \times IEi + 4.62 \times OEi$$

| | A | B | C | Total |
|---|---|---|---|---|
| Residential Population (RPi) | 15000 | 18000 | 20000 | 53000 |
| Employed Population Residing Inside Zi (EPi) | 5000 | 7000 | 10000 | 22000 |
| Households (HHi) | 2500 | 5000 | 7000 | 14500 |
| Industrial Employment in Zi (IEi) | 5500 | 8000 | 7000 | 20500 |
| Other Employment in Zi (OEi) | 500 | 1000 | 8000 | 9500 |

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(b) Derive a trip generation and attraction table using above information. If there is a mismatch between generation and attraction. State why that can happen and give a possible solution to balance generation and attraction. (11 Marks)

Consider the following two morning peak work trip generation models, estimated by linear regression for the same transport zones mentioned above.

$Y = 1.7 + (0.16 \times X1) + (1.78 \times X2)$ $R^2 = 0.589$

$Y = 3.4 + (0.18 \times X1) + (0.27 \times Z1) + (0.61 \times Z2)$ $R^2 = 0.709$

Where;

Y: Household trips to work in the morning peak hour
X1: Number of workers in the household
X2: Number of cars in the household
Z1: Dummy variable which takes the value of 1 if the household has one car
Z2: Dummy variable which takes the value of 1 if the household has two or more cars

(c) For Zone A, if 50% of its households has no cars, 30% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone using both models. (10 Marks)

## Question 02

(a) Describe the concepts of accessibility and mobility and how these concepts have contributed for the hierarchy of roads. (06 Marks)
(b) Evaluate factors affecting for restrains to mobility using suitable examples in the world (09 Marks)
(c) Evaluate how the advancement of technology has resulted in increasing and reducing mobility at the same time. (10 Marks)

## Question 03

(a) Describe closed system in aggregate demand modeling (03 Marks)
(b) Explain the four types of trip movements and state the two movements considered in closed system (05 Marks)

(c) Explain the three primary rules in a closed system considering trip attraction and generation with equations (09 Marks)

(d) Explain the importance of travel desire lines in transport modeling and draw desire lines combining both direction for the bellow O-D matrix (08 Marks)

| Origin Zone | Destination Zone | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | Total |
| A | | 500 | 1500 | 3000 | 5000 |
| B | 1500 | | 500 | 1000 | 3000 |
| C | 1000 | 2500 | | 1500 | 5000 |
| D | 500 | 1000 | 3500 | | 5000 |
| Total | 3000 | 4000 | 5500 | 5500 | 18000 |

## Question 04

(a) Transport has a direct impact for countries' economy. Critically evaluate using suitable examples in Sri Lankan context (10 Marks)

(b) Critically differentiate Strategic, Tactical and Operational levels of transport planning and how each level of planning is used to improve transport in a system approach (15 Marks)

## Question 05

(a) Briefly describe five main factors affecting transport demand with suitable examples in Sri Lankan context (10 Marks)

(b) Critically evaluate the link between transport and land use using suitable examples (15 Marks)

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## Question 06

(a) State four main factors for trip generation. (04 Marks)

(b) Briefly describe factors influencing trip attraction (06 Marks)

(c) City I and City J are two cities connected by two different roads A1 and A2. City I has a population of 200,000 while population of City J is 100,000 The design characteristics of the two roads are as follows.

| Road | Distance (km) | Average Speed (km/h) |
|---|---|---|
| Road A1 | 60 | 50 |
| Road A2 | 70 | 60 |

The following model is given to estimate total passenger demand per day between any two cities.

$$T_{ij} = \alpha_c \frac{P_i^{1.4} \times P_j^{1.7}}{GC_{ij}^{2.1}}$$

Where,

$T_{ij}$ hourly demand for passengers between i and j (both directions).

$P_i$ population of city i in thousands, where $(P_j > P_i)$

$P_j$ population of city j in thousands.

$T_{ijk}$ travel time between i and j on road k in mts.

$D_{ijk}$ travel distance between i and j by road k in km.

$\alpha_c$ $7.6145 \times 10^{-1}$

$\alpha_{ijk}$ 1.64 and

$$GC_{ijk} = \alpha_{ijk} + 0.009D_{ijk} + 0.18T_{ijk}$$

(i) Determine by calculation, which of the two roads will have the minimum Generalized Cost of travel between I and J. (07 Marks)

(ii) Determine the hourly demand for passengers between I and J in both directions. (08 Marks)

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Year 4 Semester I

SEMESTER END EXAMINATION

Strategic Management – LTSM4204

- This paper consists of SEVEN (07) questions on THREE (03) pages.
- Answer FOUR (04) 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: 2022.09.18 Pass mark: 50% Time: 02 Hours

## Question 01 (Compulsory)

You are working as a Planning Manager for a conglomerate that expanded its operations across 07 sectors. The board of directors has approached you to analyze each category and comment on future implications.

- Detergent - This market is also maturing with a reduced market growth rate. The Company owns the leading detergent brand in the country.
- Biscuit – This is a high-growth market in Sri Lanka that two local brands dominate. The Company recently entered this industry by acquiring a small biscuit company.
- Footwear - Sri Lankan footwear industry is becoming highly fragmented with the influx of small manufacturers and importers. However, the Company is the leading footwear manufacturer and the overall market growth rate is still increasing.
- Retailing– The market growth rate has decreased (low) due to reduced consumption. The Company recently acquired the leading supermarket chain in the country.
- Construction – This is also one of the fast-growing industries that grew rapidly after the war. The Company is the undisputed market leader in the industry and is involved in various construction projects.

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- Hotel – This is one of the fast-growing industries of the country after the war, and the Company is a new entrant with two small boutique hotels.
- Telecommunication – This is one of the fast-growing industries in the country, and the Company recently entered this industry with a joint venture with a new foreign firm.

(a) Select an appropriate portfolio model and place the above SBUs. Comment on the market position of each of these segments. (15 Marks)

(b) Do you think this Company has a balanced portfolio? Explain your answer, highlighting future implications of the portfolio.

(10 Marks)
(Total 25 Marks)

## Question 02

a. Identify and explain the three levels of strategy with examples. (10 Marks)

b. Explain the different types of strategies with examples (15 Marks)
(Total 25 Marks)

## Question 03

a. Why do companies need to have corporate governance systems? Explain your answer with examples of corporate failures.

(10 marks)

b. Differentiate 'Shareholder' and 'Stakeholder' systems/Models of corporate governance, highlighting their advantages and disadvantages.

(15 marks)
(Total 25 marks)

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## Question 04

a. What are two fundamental ways of achieving competitive advantage? Explain with examples.

(10 marks)

b. Explain the Porter's Three generic Strategic with practical examples

(15 marks)
(Total 25 marks)

## Question 05

a. What is the main difference between 'Competitive Advantage' and 'National Advantage'

(10 marks)

b. Explain the key elements of the Porter's Diamond model with examples.

(15 marks)
(Total 25 marks)

## Question 06

a. Select a business organization of your choice and identify 06 main stakeholder groups and their influences (10 Marks)

b. Assess/ prioritize these stakeholders with an appropriate model or framework and comment on their importance.

(15 Marks)
(Total 25 marks)

## Question 07

a. Why do change management attempts often fail? Identify and explain 04 reasons.

(10 Marks)

b. What are the barriers to innovation? Identify and explain 04 barriers.

(15 Marks)
(Total 25 Marks)

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

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Year 4 Semester I

SEMESTER END EXAMINATION

# Inventory and Warehouse Management – LTIM4203

- This paper consists of SEVEN (07) questions on SIX (06) pages.
- Answer FOUR (04) 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 sheets are attached to the question paper

Date: 2022.09.17 Pass mark: 50% Time: 02 Hours

## Question 01 (Compulsory)

(a) "Inventory helps in decoupling various parts of a production process". Explain this statement in your own words. (05 Marks)

(b) "Nivida" is a company operating in the manufacturing of two categories of fast moving consumer goods, whereas both categories of products have more or less a stable demand in every week, based on the company forecasts. Moreover, the company currently earns substantial levels of profit, which makes the company more affordable in any future capital investments. Accordingly, if the company wants to select a warehouse based on ownership to cater to future customer demands, explain a suitable warehouse type based on ownership to this company. Justify your answer.

(10 Marks)

(c) If the aforesaid company wishes to succeed in business, by automating most steps of the warehouse process, explain any warehouse automation strategy that the company can utilize, assuming that the company is setting up a private warehouse.

(10 Marks)

## Question 02

(a) Explain the three basic design considerations of a warehouse (15 Marks)

(b) Briefly explain the differences between a perpetual inventory management system and a periodic inventory management system. (10 Marks)

## Question 03

(a) Cross- docking center is a specialized warehouse designed to drastically reduce the costs associated with material handling and storage. Explain this statement in your own words. (15 Marks)

(b) Explain, how drone operations, RFID technology as well as bar-code scanners can be utilized to enhance the efficiency of the warehouse process. (10 Marks)

## Question 04

(a) "Dimensions Pvt Ltd" is a company practicing "ABC analysis" as one of the best mechanisms of managing inventory". However, despite the usual way of classifying inventory based on the annual dollar value volume of the inventory, the said company is trying to develop another suitable criteria to classify the inventory stored by the company.

Accordingly, the company stores three inventory items, provided by three different suppliers who are residing at three locations with different distances to the warehouse of the "Dimensions" company, as given from the below information.

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Table 4.01: Product and Supplier Details

| Product Name | Supplier Name | Distance to the company's warehouse |
|---|---|---|
| X | John | 100km |
| Y | Peter | 800km |
| Z | George | 20km |

Considering the given information, explain how "ABC analysis" can be applied by this company, if the criteria of the classification used by the company is the **distance of each supplier to the company's warehouse**.

(15 Marks)

(b) "Dimensions Pvt Ltd" operates 280 days in a year, and the annual demand for "product X" stored by the company is 7000 units. However, when production continues, the made orders with the supplier will be received in quantities of 700 units daily. Holding a unit of "Product X" cost the manufacturer $28 whereas each order of "product X" costs 50$. Accordingly, calculate the optimum production quantity based on the Production Order Quantity model.

(10 Marks)

## Question 05

(a) Briefly explain three key service benefits of warehousing (15 Marks)

(b) Explain how to view a warehouse as a strategic asset, considering the economic benefits of a warehouse. (10 Marks)

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## Question 06

"Seflox Pvt.Ltd" is a stationary manufacturing company, manufacturing A4 Sheets and pens. Annual demand for an A4 sheets bundle was recorded as 1500 units.

Considering the production of pens, it comprises of two colors red and blue, whereas "red pens" result in an annual demand of 700 units and the "blue pens" results in an annual demand of 900 units. Considering the "blue pens", an order cost of $80 is recorded whereas the "red pens" have an ordering cost of 80% from the aforesaid ordering cost of "blue pens".

However, the holding cost for both colors of pens despite the color is 35% from the ordering cost of a "blue pens". Moreover, an "A4 sheets bundle" is stored at a cost of $ 30, and ordered at a cost of 50% from the purchase cost of a raw materials for the manufacturing of A4 sheets, which is $60. Considering the above details calculate the following.

(a) Purchasing which color of pens would create the most cost saving to the company? Justify your answer using the total annual inventory cost calculation. (Assume the products are purchased in optimum order quantities)

(06 Marks)

(b) If the company requires to decide, whether to discontinue the "A4's production or the production of the least cost resulting pens" as discovered above, which category of the product should be discontinued? Justify your answer.

(06 Marks)

(c) Calculate the optimum order quantity for "red pens"

(04 Marks)

(d) Calculate the optimum order quantity for "blue pens"

(04 Marks)

(e) If the company orders in the optimum quantity for the "red pens", how many orders should be placed annually?

(05 Marks)

## Question 07

Write Short Notes on any five of the following topics. (5*5 Marks)

(a) Benefits of setting up a private warehouse
(b) Types of Inventory
(c) "Spot-sticking" as a service benefit of warehousing
(d) Costs of inventory
(e) Independent and dependent demand for a product
(f) Features of a distribution center
(g) Dangers of overstocking

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

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Attachment 01

1. EOQ= $\sqrt{2DS \div H}$
2. Total Annual Inventory Holding Cost= $(Q/2) * H$
3. Total Annual Inventory Ordering Cost= $\left(\frac{D}{Q}\right) * S$
4. Production Order Quantity= $\sqrt{\frac{2DS}{H\left[1-\left(\frac{d}{p}\right)\right]}}$

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Year 4 Semester I

REPEAT EXAMINATION

# Strategic Management – LTSM4206

- This paper consists of SEVEN (07) questions on FOUR (04) pages.
- Answer FOUR (04) 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: 2022.05.21 Pass mark: 50% Time: 02 Hours

## Question 01 (Compulsory)

You are working as a Planning Manager for a conglomerate that operates across 05 markets with a range of brands. You have been approached by the board of directors to analyse each category and comment on future implications.

- Rice - This industry is maturing with a reducing market growth rate. The company recently acquired the leadings packaged rice brand.
- Detergent - This market is also maturing with a reducing market growth rate. The company owns the leading detergent brand in the country.
- Biscuit – This is a high-growth market in Sri Lanka that is dominated by two local brands, The Company recently entered this industry with a new biscuit brand.

- Retailing- The overall market growth rate has decreased (low) due to reduced consumption. The company recently acquired the leading supermarket chain in the country.
- Telecommunication - This is one of the fast-growing industries in the country, and the company recently entered this industry with a joint venture with a new foreign firm.

(a) Select an appropriate portfolio model and place the above SBUs. Comment on the market position of each of these segments.

(15 Marks)

(b) Do you think this company has a balanced portfolio? Explain your answer highlighting future implications.

(10 Marks)

## Question 02

The past decade has been a disruptive period for the supermarket sector. Technological advancements, the pandemic, shifting shopper expectations, evolving food habits of consumers and western cultural influences have changed the way how supermarket retailers operate in Sri Lanka.

(a) Analyse the macro environmental changes and challenges that affect Sri Lankan Supermarket Industry with an appropriate model or framework.

(15 Marks)

(b) Identify and explain 02 key macro environmental challenge and their implications for local supermarket chains (10 Marks)

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## Question 03

(a) Explain four growth strategies available for a business organization using Ansoff's matrix with appropriate examples.

(15 Marks)

(b) Identify and explain 02 main reasons for diversifications with appropriate examples.

(10 Marks)

## Question 04

Strategies can be applied at different levels of the organization.

(a) Explain the main types of strategy with appropriate examples.

(15 Marks)

(b) Explain the different levels of strategy with appropriate examples.

(10 Marks)

## Question 05

(a) "Structure follows strategy; Strategy follows structure". Elaborate this statement with relevant concepts and industry examples.

(15 Marks)

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(b) What are the main strategy implementation barriers? Explain your answer with examples.

(10 Marks)

## Question 06

Critically discuss bases of achieving competitive advantage in terms of routes on Bowman's Strategic Clock. Use appropriate examples to validate your points.

(25 Marks)

## Question 07

In an international environment, a firm's potential for competitive advantage is determined not just by its resources and capabilities but also by the conditions of the national environment in which it operates. Use Porter's national diamond framework and explain how a particular industry within a country gains international competitive advantage using appropriate examples.

(25 Marks)

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

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Year 4 Semester I

REPEAT EXAMINATION

# Inventory and warehouse Management – LTIM4203

- This paper consists of SEVEN (07) questions on SEVEN (07) pages.
- Answer FOUR (04) 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: 2022.05.21 Pass mark: 50% Time: 02 Hours

## Question 01 (Compulsory)

(a) "One of the key functions of inventory, is to decouple various parts of a production process". Explain this statement in your own words.

(10 Marks)

(b) "ABC" company has invested on a periodic inventory management system, which has resulted in taking physical stock counts every 06 months on a periodic basis, making the company to do a stock count at the end of June, and a second stock count at the end of December. However, during the month of December, in which the physical stock counting was done for the second time in the year 2021, a difference of 500 units of a product was evident between the **actual available**

**stocks in the warehouse** and the **recorded stock amounts in the Warehouse Management System**. The inventory manager who was responsible for the above incident, identified the reason behind this large stock difference is the time period taken to do physical stock counts, which has a higher gap of 06 months in-between. Accordingly, explain in detail how cycle counting mechanism can be utilized to avoid such an incident in future for the company.

(15 Marks)

## Question 02

(a) "Rivina" is into manufacturing milk powder as a household business in Sri Lanka. However, due to increasing demand towards milk powder at present day in Sri Lanka "Rivina" is guaranteed of a high profit margin from her business. Moreover, manufacturing a product under Fast Moving Goods category, "Rivina" has the opportunity to forecast easily due to the steady demand for her product. Assuming "Rivina" has ample amount of profits at present from her business, she is currently evaluating options to invest on a warehouse to store her products. Considering the given scenario, suggest a possible warehouse category based on ownership to be setup by "Rivina", explaining the advantages and the disadvantages of the suggested warehouse category based on ownership.

(15 Marks)

(b) Assuming "Rivina" is to setup her own private warehouse. Briefly explain THREE key warehouse design considerations, she has to take into account when designing the warehouse

(10 Marks)

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## Question 03

(a) "Consolidation center is a specialized warehouse, utilized obtain benefits when shipping inventory, into a specific destination". Briefly explain this statement by assuming multiple shipments from North American countries reach Sri Lankan consolidation centers in Colombo port, where the cargo is bound to North Asian countries.

(10 Marks)

(b) "Warehouse automation is eminent at present day pacing technology. Radio Frequency Identification is one of such important inventions remarkably helping in tracking and tracing of inventory". Explain the "RFID" technology, along with the benefits of implementing RFID technology in a warehouse

(15 Marks)

## Question 04

(a) "Gartier Pvt.Ltd" is a company practicing "ABC analysis" as one of the best mechanisms of managing inventory". However, despite the usual way of classifying inventory based on the annual dollar value volume of the inventory, the said company is trying to develop another suitable criterion to classify the inventory stored by the company.

Accordingly, the company stores three inventory items, which are comprised of three different lead times, where "product A" has a lead time of eight days (08) to be received to the warehouse, "product B" has a lead time of four days (04) to be

received to the warehouse, and "product C" has a lead time of a week to be received to the warehouse. Considering the given information, explain how "ABC analysis" can be applied by this company.

(15 Marks)

(b) "Gartier Pvt.Ltd" operates 300 days in a year, and the annual demand for "product A" stored by the company is 500 units. However, when production continues, the made orders with the supplier will be received in quantities of 100 units daily. Holding a unit of "Product A" cost the manufacturer $4 whereas each order of "product A" costs 10$. Accordingly, calculate the optimum production quantity based on the Production Order Quantity model.

(10 Marks)

## Question 05

"Rainmill (Pvt.) Ltd." is a renowned soap manufacturing company, where two of the manufactured products in the company results in the highest profits for the company. One such product involves a **"sandalwood beauty soap"**, which comprises of a steady demand of 4000 units.

The other product is an **"almond milk beauty soap"**, which comprises of two colors, whereas "white color almond milk beauty soap" is resulting an annual demand of 3000 units and the "pink color almond milk beauty soap" results in an annual demand of 2000 units. Considering the "pink color almond milk beauty soap", an order cost of $60 is recorded whereas the "white color almond milk

soap" has an ordering cost of 50% from the aforesaid ordering cost of "pink color almond milk beauty soap".

However, the holding cost for both colors of almond milk soaps despite the color is 15% from the ordering cost of a "pink color almond milk soap". Moreover, the "sandalwood beauty soap" is stored at a cost of $ 20 each, and ordered at a cost of 60% from the purchase cost of a "sandalwood beauty soap" which is $40. Considering the above details calculate the following.

(a) Purchasing which color of an almond milk beauty soap would create the most cost saving to the company? Justify your answer using the total annual inventory cost calculation. (Assume the products are purchased in optimum order quantities)

(06 Marks)

(b) If the company requires to decide, whether to discontinue the "sandalwood beauty soap" production or the production of the least cost resulting "almond milk beauty soap" as discovered above, which category of the product should be discontinued? Justify your answer.

(06 Marks)

(c) Calculate the optimum order quantity for "pink color almond milk beauty soap"

(04 Marks)

(d) Calculate the optimum order quantity for "white color almond milk beauty soap"

(04 Marks)

(e) If the company orders in the optimum quantity for the "white color almond milk beauty soap", how many orders should be placed annually?

(05 Marks)

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## Question 06

(a) Suppose you are seeking an employment opportunity as a warehouse manager of a renowned company. Assume that during the interview process, the interview panel, requires you to explain how a warehouse could be utilized to obtain competitive advantage, by making the warehouse a strategic asset. Accordingly, considering the economic benefits of a warehouse, explain how a warehouse can be utilized as a strategic asset.

(10 Marks)

(b) As the second question from the interview panel, if the aforesaid company, wants you to explain the service benefits of a warehouse, to make sure the warehouse is a strategic asset, explain in detail how service befits from a warehouse could lead to competitive advantage.

(10 Marks)

(c) "Packaging" is an integral function of any of the warehouses. Accordingly, briefly explain the types of packaging which bring about such importance.

(05 Marks)

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## Question 07

Write Short Notes on any **FIVE** of the following topics

(a) RFID Technology

(b) Cycle counting as a renowned inventory management mechanism

(c) Just in Time Inventory Strategy and its benefits

(d) Types of warehouses based on ownership

(e) Perpetual Inventory Management System

(f) Concept of cross-docking and its benefits

(g) Three basic design considerations of a warehouse

(05*05 Marks)

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

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Year 4 Semester I
REPEAT EXAMINATION
Strategic Management – LTSM4204

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer Four (04) Questions including Question No. 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: 2021.04.18 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

ABC PLC is one of the leading conglomerates of the country that operates across 06 industries. You have been appointed as a strategic planner to decide the optimum allocation of funds across these strategic business units.

- Energy – This is one of the most lucrative and growing markets recently opened for the private sector. The company is yet to achieve a unique position in the market.
- ICT – This is one of the fast-growing industries in the country and the company is the leader in this industry.
- Toothpaste – Overall market for dental care is increasing and the company owns two leading toothpaste brands in the country.
- Footwear – This is one of the fast-growing industries of the country, and the company entered this market with a small new company.
- Construction – The growth of this industry has slowed down recently. The company is the undisputed market leader in the industry and involved in a range of construction projects.

- Hotel – The industry growth rate has slowed down significantly, and the company owns two small boutique hotels.

(a) Select an appropriate portfolio model and place the above SBUs. Comment on the market position of each of these segments. (15 Marks)

(b) Do you think this Piccadilly PLC has a balanced portfolio? Explain your answer highlighting the implications. (10 Marks)

(Total 25 Marks)

## Question : 02

"Corporations are diversifying their businesses due to many reasons. It considers that diversified companies perform better than undiversified companies".

- Evaluate these statement by explaining 05 reasons for diversifications with appropriate real-world examples.

(Total 25 Marks)

## Question : 03

Critically assess the bases of achieving competitive advantage for a business unit using Porters Three Generic Strategy Model with examples.

(Total 25 Marks)

## Question : 04

A firm's potential for competitive advantage is determined not just by its resources and capabilities but also by the conditions of the national environment in which it operates.

- Explain the key determinants of National Advantage using Porter's Diamond Model framework with appropriate examples. (Total 25 marks)

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## Question : 05

According to Mintel, the Sri Lanka Biscuit market is largely duopolistic with two leading players hold 90% of the market share. In 2008, the country's per capita biscuit consumption was in the region of four kilograms (kg) – much higher than India's 1.1 kg and Indonesia's 1.6 kg. At the time, biscuit consumption in Sri Lanka was pegged at slightly below 44,000 metric tons a year and its value at around Rs. 17.8 billion.

*--Source – Internet--*

- Analyze the macro-environmental changes and challenges that affect Sri Lankan Biscuit Industry with an appropriate model or framework.

(Total 25 marks)

## Question : 06

You are the planning manager of a well-established beverage company that specialized in carbonated soft drinks. You have been approached by senior management to identify the other growth options available for the company.

- You are required to identify and explain the main growth options available for the company using an appropriate model/ framework. (Total 25 marks)

## Question : 07

"**Structure Follows Strategy**". Critically evaluate this statement using appropriate examples of your choice. (Total 25 marks)

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

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library 02

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Year 4 Semester I
REPEAT EXAMINATION
Modelling in Transport and Logistics – LTML4202

- This paper consists of SEVEN questions on EIGHT (08) pages.
- Answer Four (04) Questions including Question No. 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: 2021.04.17 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

a) State three (03) characteristics of demand for transport. (03 Marks)

b) Describe three (03) elements of transport system. (03 Marks)

c) State three (03) characteristics of supply for transport. (03 Marks)

d) Define the following terminologies commonly used in statistics.

i. Data

ii. Sample

iii. Population of interest (03 Marks)

e) Briefly describe the four interconnected processes in planning transportation. (04 Marks)

f) Briefly describe the importance of transport modelling in transport planning. (04 Marks)

g) Describe the instance for the equilibrium that could happen for demand and supply for transport. (05 Marks)

## Question : 02

a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (04 Marks)

b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

i. Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers.

ii. Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (06 Marks)

c) Describe two (02) types of errors possible in transport modeling. (06 Marks)

d) Describe two (02) methods used to collect data in transport modeling projects. (06 Marks)

e) Describe a practical consideration in sampling. (03 Marks)

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## Question : 03

a). State four (04) factors affecting freight trip generation of a manufacturing plant.

(06 Marks)

b). Consider a zone with the following characteristics

Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(10 Marks)

c). Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{}{0.50} + \underset{(2.5)}{2.0x_1} + \underset{(6.9)}{1.5x_2} \quad R^2 = 0.589 \quad \underset{(5.6)}{}$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

Where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

Choose one of the models explaining clearly the reasoning behind your decision.

(04 Marks)

d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(05 Marks)

## Question : 04

a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

- Hint - assume that you have collected data to represent monthly travel behaviors of the passengers, only procedures need to be discussed.

(04 Marks)

b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(06 Marks)

c) Briefly explain the Gravity Distribution Model to model trip distributions. (Hint - A possible scenario can be assumed, and only singly constrained trip distribution can be thought of). (05 Marks)

d) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q4-d1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-d2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

Table Q4-d3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.

$P_i$ - Total number of trips produced in zone i

$A_j$ - Number of trips attracted to zone j

$F_{ij}$ - A value which is an inverse function of travel time

$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above. (10 Marks)

## Question : 05

a) State briefly the use of modal split models in transport planning. (02 Marks)

b) An inter-urban mode choice study is being undertaken for people with a choice between car and rail. The TableQ5-b was obtained as a result of a survey on five origin-destination pairs from A to E.

Table Q5-b. Survey results

| O–D | Elements of cost by each mode | | | | Proportion choosing car |
|---|---|---|---|---|---|
| | Car | | Rail | | |
| | $X_1$ | $X_2$ | $X_1$ | $X_2$ | |
| A | 3.05 | 9.90 | 2.50 | 9.70 | 0.80 |
| B | 4.05 | 15.10 | 2.02 | 14.00 | 0.51 |
| C | 3.25 | 9.30 | 2.25 | 8.60 | 0.57 |
| D | 3.50 | 11.20 | 2.75 | 10.30 | 0.71 |
| E | 2.45 | 6.10 | 2.04 | 4.70 | 0.63 |

Where, $X_1$ is the travel time (in hours) and $X_2$ the out-of-pocket cost (in rupees). Assume that the 'value of time' coefficient is 2.00 per hour.

i. Calculate the generalized cost of travelling by each mode. (08Marks)
ii. Calibrate a binary Logit modal-split model with these data.

Hint:

For a linear equation y = a + bx

$$b=\frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

(15 Marks)

## Question : 06

a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

Highway Network:

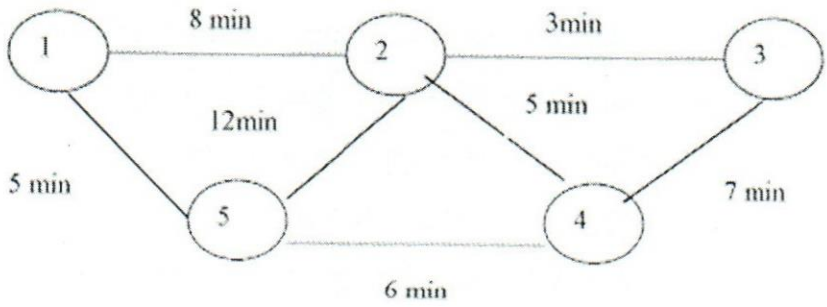


Figure Q6-a: Highway network

(15 Marks)

b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

i. Fit a linear equation relating trip generation rate and household size.

(10 Marks)

Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

Hint:

For a linear equation $y = a + bx$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

## Question : 07

Write short notes for the following:

a) Comparison of simple random sampling versus stratified random sampling

b) Traffic congestion' in terms of traffic flow and travel time

c) Wardrop's Principles of Equilibrium in traffic assignment

d) Central Limit Theorem in sample size estimation

e) Quality improvements to public transport systems in Sri Lanka

(05 Marks Each X 05 = 25 Marks)

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

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Year 4 Semester I

SEMESTER END EXAMINATION

Inventory and Warehouse Management – LTIM4203

- This paper consists of SEVEN (07) questions on SIX (06) pages.
- Answer FOUR (04) 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 sheets are attached to the question paper

Date: 2020.09.26 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

Danone's New WMS

Danone's distribution centre in Valdemoro (Spain) must cope with a very high-paced daily work rhythm: managing between 500 and 600 SKUs and preparing up to 700 orders. It is an all-in-one omni-channel warehouse, i.e. orders are sent to retailers, wholesalers and customers who have purchased the products via the website. Danone has introduced a new Warehouse Management System (WMS) with two modules; Multi Carrier Shipping, which communicates with the shipping agencies that distribute online orders, and Supply Chain Analytics, used to analyze the data and achieve a more streamlined, modern and intelligent logistics.

The new WMS has a hand in all operations: goods reception, slot allocation, order prep and dispatch. In addition, it guarantees product tracking, from the moment they arrive at the warehouse until they are delivered to the customers.

a) Explain the growing need for Smart Warehousing Management Systems? (07 Marks)

b) What are the cons & cons of using Smart WMS? (09 Marks)

c) What are the possible ways of using Analytics in warehouse management? (09 Marks)

## Question 02

Operators use RFID devices to communicate with the WMS in real-time at Danone warehouse. These handheld devices receive orders and operators use them to confirm which orders are completed. Identifying each product from the moment it arrives at the warehouse is the key to solid product tracking. For this reason, the receipt of goods is a fundamental operation when it comes to guaranteeing a smooth running logistics chain for Danone. The WMS has all products pin pointed and knows their stock status in real-time.

a) Explain the importance of product visibility in inventory & warehouse management with examples. (12 Marks)

b) Elaborate how ABC analysis can be used to monitor & optimize stock status with an appropriate example. (13 Marks)

## Question 03

a) Explain the purpose of Inventory Management (05 Marks)

b) What is cycle counting? (05 Marks)

c) What is consolidation? (05 Marks)

d) Explain Put-away in warehousing? (05 Marks)

e) What is JIT scheduling? (05 Marks)

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## Question 04

Due to prevailing Corona crisis Brandaxi which is an apparel manufacturer in Sri Lanka provides one face mask pack for all its staff of 3500 on a monthly basis. The value of one Face Mask pack is USD 7 and orders are placed once a month at a cost of USD 100. Holding cost is one tenth of the value of a face mask pack.

a) What is the total cost for the current order quantity? (05 Marks)
b) What is the economic order quantity (EOQ)? (05 Marks)
c) How many orders will be placed per year using the EOQ? (07 Marks)
d) Determine the ordering, holding, and total inventory costs for the EOQ. How has the total cost changed? (08 Marks)

## Question 05

The main cafeteria of UniLearn currently has an out of stock level of 24% with a standard deviation of 24 for its lunch time meals. The cafeteria sells 120 meals per hour during lunch time with a waiting time of 20 minutes from the kitchen.

a) How many meals should be kept ready in order to offer reduce the out of stock level to 12%? (08 Marks)
b) What is the reorder point for kitchen to bring in next batch of meals? (07 Marks)
c) How would the reorder point change, if the service level changed to 99%? (10 Marks)

## Question 06

Covid-19 crisis is testing invneeotyr & warehouse management resilience.

a) Elaborate on the inventory management challenges posed by the ongoing crisis with examples. (12 Marks)

b) Explain how Inventory & warehouse management can be used as a strategic asset during this crisis to attain competitive advantage with examples.

(13 Marks)

## Question 07

(a) Performance metrics are an important aspect in effective inventory management.

Explain the key metrics that needs to be tracked in order to improve overall inventory levels taking Keells Supermarket as an example. (12 Marks)

b) First-in-First-Out is used as an effective inventory management strategy to preserve on shelf freshness for retail products.

Explain the importance of preserving product freshness in Inventory Management with appropriate examples. (13 Marks)

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

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**Attachment 1**
Equations

$$Q = \sqrt{\frac{2DS}{H}}$$

$$TC_{EOQ} = \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right)$$

*Where*

$TC$ = total annual cost

$D$ = annual demand

$Q$ = quantity to be ordered

$H$ = annual holding cost

$S$ = ordering or setup cost

$$R = dL$$

where $R$ = reorder point in units

$d$ = daily/weekly demand in units

$L$ = lead time in days/weeks

$$R = dL + SS$$

where $SS$ = safety stock in units

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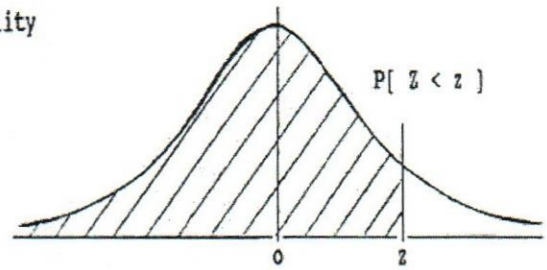
# STANDARD STATISTICAL TABLES

## 1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z

i.e. $$P[\, Z < z \,] = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-\tfrac{1}{2}Z^2)\, dZ$$




| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5159 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7854 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8804 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9773 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9865 | 0.9868 | 0.9871 | 0.9874 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9924 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9980 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| z | 3.00 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 | 3.60 | 3.70 | 3.80 | 3.90 |
| P | 0.9986 | 0.9990 | 0.9993 | 0.9995 | 0.9997 | 0.9998 | 0.9998 | 0.9999 | 0.9999 | 1.0000 |

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Year 4 Semester I

SEMESTER END EXAMINATION

Strategic Management – LTSM4206

- This paper consists of SEVEN (07) questions on FOUR (04) pages.
- Answer FOUR (04) 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: 2020.09.20 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

Piccadilly PLC is one of the leading conglomerates of the country that operates across 05 industries. You have been appointed as a strategic planner to decide the optimum allocation funds across these strategic business units.

ICT – This is one of the fast-growing industries in the country and the company is the leader in this industry.
FM Channel - This is also one of the fast-growing industries in the country, and the company recently entered this market by acquiring the leading FM Channel in the country.
Telecommunication – This is one of the fast-growing industries of the country, and the company entered this market with a small new company.
Energy – This is one of the most lucrative and growing markets recently opened for the private sector. The company is yet to achieve a unique position in the market.
Construction – The growth of this industry has slowed down recently. The company is the undisputed market leader in the industry and involved in a range of construction projects.
Hotel – This is one of the fast-growing industries of the country after the war, and the company recently entered this sector by acquiring a small boutique hotel.

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(a) Select an appropriate portfolio model and place the above SBUs. Comment on the market position of each of these segments. (15 Marks)

(b) Do you think this Piccadilly PLC has a balanced portfolio? Explain your answer highlighting the implications.

(10 Marks)
(Total 25 Marks)

## Question 02

The banking sector in Sri Lanka, which comprises Licensed Commercial Banks (LCBs) and Licenced Specialised banks (LSBs), dominates the financial system and accounts for the highest share of the total assets in the financial system. Banks play a critical role within the Sri Lankan economy, as they are engaged in the provision of liquidity to the entire economy, while transforming the risk characteristics of assets.

(Source: CBSL)

(a) Analyse the macro-environmental changes and challenges that affect the Sri Lankan Commercial Banking Industry with an appropriate model or framework

(15 Marks)

(b) Identify and explain 02 key macro-environmental challenge and their implications for Private Commercial Banks in Sri Lanka.

(10 Marks)
(Total 25 Marks)

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## Question 03

(a) Explain different types of strategy with examples of your choice.
(15 Marks)

(b) Strategy can be seen in different ways. Explain this statement using Five P's of Strategy
(10 Marks)
(Total 25 Marks)

## Question 04

Michael Porter is the founder of the modern strategy field and one of the world's most influential thinkers on management and competitiveness.
(a) Explain the Porter's three generic strategic with practical examples.
(15 marks)

(b) What is meant by National Advantage? Explain your answer with determinants of national advantage and practical examples.
(10 marks)
(Total 25 marks)

## Question 05

(a) Structure Follows Strategy. Critically evaluate this statement using appropriate examples of your choice. (15 marks)

(b) What are the main barriers to innovation? Briefly explain 04 barriers to innovation.
(10 marks)
(Total 25 marks)

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## Question 06

(a) Explain the balanced scorecard technique with a hypothetical example of your choice
(15 marks)

(b) Identify and explain the main barriers to implementation
(10 marks)
(Total 25 marks)

## Question 07

(a) What is meant by globalization? Explain your answer highlighting its implications.
(15 marks)

(b) Briefly explain the key characteristic before and after Globalization
(10 marks)
(Total 25 marks)

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

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BSc Hons in Logistics and Transportation
Course CODE: COM551

Year 4 Semester I

SEMESTER END EXAMINATION

Modelling in Transport and Logistics – LTML4202

- This paper consists of SEVEN (07) questions on EIGHT (08) pages.
- Answer FOUR (04) 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.
- Students' t-table is attached.

Date: 2020.09.13 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

a) State three (03) characteristics of demand for transport. (03 Marks)

b) Describe three (03) elements of transport system. (06 Marks)

c) Define the following terminologies commonly used in statistics.
I. Data
II. Sample
III. Population of interest (03 Marks)

d) Briefly describe the four interconnected processes in planning transportation. (08 Marks)

e) Describe the instance for the equilibrium that could happen for demand and supply for transport. (05 Marks)

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## Question 02

a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (04 Marks)

b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

I. Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers.

II. Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (06 Marks)

c) Describe two (02) types of errors possible in transport modeling. (06 Marks)

d) Describe two (02) methods used to collect data in transport modeling projects. (06 Marks)

e) Describe a practical consideration in sampling. (03 Marks)

## Question 03

a). State four (04) factors affecting freight trip generation of a manufacturing plant. (06 Marks)

b). Consider a zone with the following characteristics

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Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(10 Marks)

c). Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{(2.5)}{0.50} + \underset{(6.9)}{2.0x_1} + \underset{(5.6)}{1.5x_2} \quad R^2 = 0.589$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

Choose one of the models explaining clearly the reasoning behind your decision.

(04 Marks)

d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(05 Marks)

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## Question 04

a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

Hint - assume that you have collected data to represent monthly travel behaviours of the passengers,
Only procedures need to be discussed

(04 Marks)

b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(06 Marks)

c) Briefly explain the Gravity Distribution Model to model trip distributions.
(Hint - A possible scenario can be assumed and only singly constrained trip distribution can be thought of)

(05 Marks)

d) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q4-d1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-d2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

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Table Q4-d3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.
$P_i$ - Total number of trips produced in zone i
$A_j$ - Number of trips attracted to zone j
$F_{ij}$ - A value which is an inverse function of travel time
$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(10 Marks)

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## Question 05

a) State briefly the use of modal split models in transport planning.

(02 Marks)

b.) An inter-urban mode choice study is being undertaken for people with a choice between car and rail. The TableQ5-b was obtained as a result of a survey on five origin-destination pairs from A to E.

Table Q5-b. Survey results

| | Elements of cost by each mode | | | | |
|---|---|---|---|---|---|
| | Car | | Rail | | |
| O–D | $X_1$ | $X_2$ | $X_1$ | $X_2$ | Proportion choosing car |
| A | 3.05 | 9.90 | 2.50 | 9.70 | 0.80 |
| B | 4.05 | 13.10 | 2.02 | 14.00 | 0.51 |
| C | 3.25 | 9.30 | 2.25 | 8.60 | 0.57 |
| D | 3.50 | 11.20 | 2.75 | 10.30 | 0.71 |
| E | 2.45 | 6.10 | 2.04 | 4.70 | 0.63 |

Where, $X_1$ is the travel time (in hours) and $X_2$ the out-of-pocket cost (in rupees). Assume that the 'value of time' coefficient is 2.00 per hour.

I) Calculate the generalized cost of travelling by each mode.

(08 Marks)

II) Calibrate a binary Logit modal-split model with these data.

Hint:

For a linear equation y = a + bx

$$b=\frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

(15 Marks)

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## Question 06

a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

Highway Network:

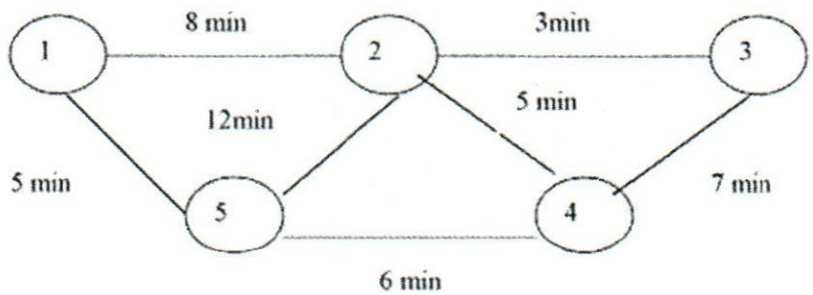


Figure Q6-a: Highway network

(15 Marks)

b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

I. Fit a linear equation relating trip generation rate and household size.

(10 Marks)

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Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

Hint:

For a linear equation y = a + bx

$$b=\frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

## Question 07

Write short notes for the following:

a) Comparison of simple random sampling versus stratified random sampling
b) Traffic congestion' in terms of traffic flow and travel time
c) Wardrop's Principles of Equilibrium in traffic assignment
d) Central Limit Theorem in sample size estimation
e) Quality improvements to public transport systems in Sri Lanka

(5*5 Marks)

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

# *t* Table

| cum. prob | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **one-tail** | **0.50** | **0.25** | **0.20** | **0.15** | **0.10** | **0.05** | **0.025** | **0.01** | **0.005** | **0.001** | **0.0005** |
| **two-tails** | **1.00** | **0.50** | **0.40** | **0.30** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.002** | **0.001** |
| **df** | | | | | | | | | | | |
| 1 | 0.000 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 0.000 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | 0.000 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | 0.000 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | 0.000 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | 0.000 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | 0.000 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | 0.000 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | 0.000 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | 0.000 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | 0.000 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | 0.000 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | 0.000 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | 0.000 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | 0.000 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | 0.000 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | 0.000 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | 0.000 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | 0.000 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | 0.000 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | 0.000 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | 0.000 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | 0.000 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | 0.000 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | 0.000 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | 0.000 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | 0.000 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | 0.000 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | 0.000 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | 0.000 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 40 | 0.000 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 60 | 0.000 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 80 | 0.000 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 100 | 0.000 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 1000 | 0.000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| ***z*** | 0.000 | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| | 0% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.8% | 99.9% |
| | **Confidence Level** | | | | | | | | | | |

00010

# Colombo International Nautical and Engineering College

CINEC Campus
Faculty of Management, Humanities and Social Sciences
Department of Logistics & Transport
BSc (Hons.) in Logistics and Transportation
Course CODE: COM551

## Year 4 Semester I
## REPEAT EXAMINATION
## Strategic Management – LTSM4206

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer FOUR 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: 2020.01.19 Pass mark: 50% Time: 02 Hours

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## Question 01: (Compulsory)

Sri Lankan supermarket industry has been subject to a range of macro environmental changes over the last two decades. Nevertheless, it is still considered as a very attractive industry where both local and global firms follow different strategies to remain competitive and strong.

(a) Analyse the macro environment changes and challenges that affect Sri Lankan education industry with an appropriate model or framework.

(b) Identify and explain 03 key macro environmental challenge and their implications on leading supermarket chains.

(25 Marks)

## Question 02

(a) Explain the different types of strategies with examples

(b) Identify and explain the three levels of strategy with examples.

(25 Marks)

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## Question 03

(a) Identify the explain the key elements of strategic management.

(b) Explain the difference between strategic management and operational management.

(25 Marks)

## Question 04

(a) Why change management attempts often fail? Identify and explain 04 reasons.

(b) What are the barriers for innovation? Identify and explain 04 barriers.

(25 Marks)

## Question 05

You have been appointed as a strategist for multinational company that operates in 04 different areas namely,

Hotel – The growth rate of the industry has reduced dramatically and the company is a new entrant with two small boutique hotels.

Construction – This is also one of the fast-growing industries that grew rapidly after the war. The company is the market undisputed leader in the industry and involved in a range of construction projects.

Retailing– This is one of the most lucrative markets and few companies like Arpico and Cargill's dominate this market. The company is yet to achieve a unique position in the market.

Footwear - Sri Lankan footwear industry is becoming highly competitive with the influx of small manufacturers and importers. However, the company is the leading footwear manufacturer and the overall market growth rate is still increasing

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(a) Select an appropriate portfolio model and place the above SBU's. Comment on the market position of each of these SBUs.

(b) Do you think this has a balanced portfolio? Briefly justify your answer.

(25 Marks)

## Question 06

(a) Explain the Porter's Three generic Strategic with practical examples

(b) Explain the key elements of the Porter's Diamond model with examples.

(25 Marks)

## Question 07

(a) Explain the main growth options/ strategies available for a business using Ansoff matrix with examples.

(b) Identify and explain 04 main reasons for diversification with examples?

(25 Marks)

## Question 08

(a) Select a business organization of your choice and identify 06 main stakeholder groups and their influences

(b) Assess/ prioritize these stakeholders with an appropriate model or framework

(25 Marks)

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

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Year 4 Semester I

REPEAT EXAMINATION

# Modelling in Transport and Logistics – LTML4202

- This paper consists of SEVEN (07) questions on NINE (09) pages.
- Answer FOUR (04) 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.
- Students' t-table is attached.

Date: 2020.01.18 Pass mark: 50% Time: 02 Hours

## Question 01

Fill in the blanks using appropriate words. (Use the answer scripts provided)

I. A ..... is a simplified representation of a part of the real world–the system of interest–which focuses on certain elements considered important from a point of view.

II. Models attempt to replicate the system of interest and its behavior by means of mathematical equations based on certain ..... statements about it.

III. The demand for transport is ..... It is not an end on its own.

IV. ..... is the degree to which a measurement or model result matches true or accepted values.

V. ..... refers to the level or units of measurement used to collect data and deliver model outputs.

VI. ..... which is at the heart of the sample size estimation problem, postulates that the estimates of the mean from a sample tend to become distributed Normal as the sample size (n) increases.

VII. ..... does not affect the expected values of the means of the estimated parameters; it only affects the variability around them, thus determining the degree of confidence that may be associated with the means; it is basically a function of sample size and the inherent variability of the parameter under investigation.

VIII. ..... is caused by mistakes made either when defining the population of interest, or when selecting the sampling method, the data collection technique or any other part of the process.

IX. The ..... is defined as a collection of units which has been especially selected to represent a larger population with certain attributes of interest.

X. ..... is a one-way movement from a point of origin to a point of destination.

XI. It is often convenient to use a measure combining all the main attributes related to the disutility of a journey and this is normally referred to as the ..... This is typically a linear function of the attributes of the journey weighted by coefficients which attempt to represent their relative importance as perceived by the traveler.

XII. ..... models estimate trips for each cell in the matrix without directly using the observed trip pattern. Therefore, they are sometimes called synthetic as opposed to growth factor models.

XIII. The Gravity Model for trip distribution gets its name from the fact that it is conceptually based on Newton's law of .....

XIV. Trip ..... attempts to determine the connection between trip making and land use factors.

XV. Degree of ..... association between two variables can be measured by correlation analysis.

XVI. Ratio, interval, ordinal and ..... are the four types of scales of measurement of variables.

XVII. ..... is the study of the dependence of an explanatory variable on one or more predictor variables with the view to estimate the mean or average value of the explanatory variable using the fixed or known values of the predictor variables.

XVIII. Trips may be made by different methods or modes of travel and the determination of the choice of travel mode is known as .....

XIX. The binary ..... is used to estimate the probability of a binary response based on one or more predictor (or independent) variables.

XX. ..... concerns the selection of routes (alternative called paths) between origins and destinations in transportation networks.

**[1.25 Each X 20 =Total 25 Marks]**

## Question 02

a) State each advantages and limitation of the following methods of modeling trip generation.

i. Regression analysis
ii. Category analysis

(04 Marks)

b) Consider the following trip attraction models estimated using a standard computing package (t-ratios are given in parentheses):

$$Y = 123.2 + 0.89X_1 \qquad R^2 = 0.90$$

(5.2) (7.3)

$$Y = 40.1 + 0.14X_2 + 0.61X_3 + 0.25X_4 \qquad R^2 = 0.925$$

(6.4) (1.9) (2.4) (1.8)

$$Y = -1.7 + 2.57X_1 - 1.78X_2 \qquad R^2 = 0.996$$

(-0.6) (9.9) (-9.3)

Where Y is the work trips attracted to the zone, $X_1$ is total employment in the zone, $X_2$ is industrial employment in the zone, $X_3$ is commercial employment in the zone and $X_4$ is service employment.

Choose the most appropriate model, clearly explaining all its pros and cons.

(09 Marks)

c) The Table Q2-c1 presents some data collected in the last household O–D survey (made ten years ago) for three particular zones:

Table Q2-c1: O-D survey results for three zones

| Zone | Residents /Household | Workers/Household | Mean income | Population |
|---|---|---|---|---|
| I | 2.0 | 1.0 | 50,000 | 20,000 |
| II | 3.0 | 2.0 | 70,000 | 60,000 |
| III | 2.5 | 2.0 | 100,000 | 100,000 |

Ten years ago, two household-based trip generation models were estimated using this data. The first was a linear regression model given by:

$$y = 0.2 + 0.5x_1 + 1.1Z_1 \quad R^2 = 0.78$$

where $y$ is household peak hour trips, $x_1$ is the number of workers in the household and $Z_1$ is a dummy variable which takes the value of 1 for high income (> 70,000) households and 0 in other cases.

The second was a category analysis model based on two income strata (low and high income) and two levels of family structure (1 or less and 2 or more workers per household). The estimated trip rates are given in the Table Q2-c2.

Table Q2-c2: O-D Estimated trip rates

| Family structure | Income | |
|---|---|---|
| | Low | High |
| 1 or less | 0.8 | 1.0 |
| 2 or more | 1.2 | 2.3 |

If the total number of trips generated today during the peak hour by the three zones are given in Table Q2-c3.

Table Q2-c3: Total trips generated today by three zones

| Zone | Peak hour trips |
|---|---|
| I | 8,200 |
| II | 24,300 |
| III | 92,500 |

It is also estimated that the zone characteristics (income, number of households and family structure) have remained stable. Decide which model is the best. Explain your answer.

(12 Marks)

## Question 03

a) Briefly compare growth factor and gravity models in trip distribution.

(05 Marks)

b) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q3-b1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 250 | 450 | 300 | 1000 |
| Trip Attractions | 395 | 180 | 425 | 1000 |

Table Q3-b2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 6 | 4 | 2 |
| 2 | 2 | 8 | 3 |
| 3 | 1 | 3 | 5 |

Table Q3-b3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 13 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ – Number of trips that are produced in zone i and attracted to zone j.

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Year 4 Semester I

REPEAT EXAMINATION

Inventory and warehouse Management – LTIM4203

- This paper consists of SEVEN questions on SIX (06) pages.
- Answer FOUR 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 documents are attached to the question paper.

Date: 2020.01.18 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

Artificial Intelligence (AI) & Inventory

Supply chain management has grown by leaps and bounds in the last couple of decades. Increasing customer demands have forced companies to focus more on their production processes, and this has intensified the need for better inventory management. Manual inventory taking is long gone, and artificial intelligence has taken over in ensuring that the inventory management is up to the challenge.

(a) Explain the growing need for using AI in inventory management?

(07 Marks)

(b) What are possible ways of using AI in inventory management?

(09 Marks)

(c) What are the possible concern areas or risks of using AI in inventory management?

(09 Marks)

## Question 02

Home Grow is a company that imports indoor plant growing units with the popularity of urban farming in Sri Lanka and estimates demand to be approximately 2,400 units. Buying price of a unit is $ 35 and the monthly holding cost is 3% of unit's value. It costs approximately $25 to place an order. Home Grow currently orders 100 units twice a month.

(a) What is the total cost for the current order quantity?

(05 Marks)

(b) What is the economic order quantity (EOQ)?

(05 Marks)

(c) How many orders will be placed per year using the EOQ?

(07 Marks)

(d) Determine the ordering, holding, and total inventory costs for the EOQ. How has the total cost changed?

(08 Marks)

## Question 03

Upon closer observation, Home Grow determines that the demand is normally distributed with standard deviation of demand 4 units per day. (Home Grow is open 300 days per year.) It usually takes about 4 days to receive an order through air freight from the factory in China.

(a) What is the safety stock needed to achieve a service level of 94%? What is the holding cost associated with this safety stock?

(08 Marks)

(b) What is the reorder point?

(07 Marks)

(c) How would the reorder point change, if the service level changed to 99%?

(10 Marks)

## Question 04

(a) What is considered as inventory in logistics? (05 Marks)

(b) What is month end counting? (05 Marks)

(c) Explain warehousing as a strategic asset? (05 Marks)

(d) Explain Receiving in warehousing? (05 Marks)

(e) What is JIT scheduling? (05 Marks)

## Question 05

Real-Time Inventory Management has become a major challenge for many supply chains.

(a) Explain the different challenges for real-time inventory management.

(12 Marks)

(b) Write a short report on solutions to improve real-time inventory management.

(13 Marks)

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## Question 06

(a) Explain the factors that need to be considered when selecting a suitable location for a new fulfillment center for the new market entrant Coat Paints for centralized deliveries throughout the country.

(10 Marks)

(b) Write a mini report elaborating on the design considerations for layout design of the new fulfilment center for Coat Paints. (15 Marks)

## Question 07

(a) What are the advantages of point-of-use stock storage? Briefly explain the role of packaging. (12 Marks)

(b) What is break bulk in warehousing? (08 Marks)

(c) What are the benefits of warehousing? (05 Marks)

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

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**Attachment 1**
Equations

$$Q = \sqrt{\frac{2DS}{H}}$$

$$TC_{EOQ} = \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right)$$

*Where*

$TC$ = total annual cost

$D$ = annual demand

$Q$ = quantity to be ordered

$H$ = annual holding cost

$S$ = ordering or setup cost

$$R = dL$$

where $R$ = reorder point in units

$d$ = daily/weekly demand in units

$L$ = lead time in days/weeks

$$R = dL + SS$$

where $SS$ = safety stock in units

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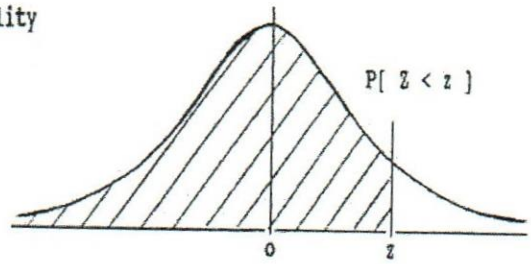
# STANDARD STATISTICAL TABLES

## 1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z

i.e. $$P[\, Z < z \,] = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-\tfrac{1}{2}Z^2)\, dZ$$




| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5159 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7854 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8804 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9773 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9865 | 0.9868 | 0.9871 | 0.9874 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9924 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9980 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| z | 3.00 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 | 3.60 | 3.70 | 3.80 | 3.90 |
| P | 0.9986 | 0.9990 | 0.9993 | 0.9995 | 0.9997 | 0.9998 | 0.9998 | 0.9999 | 0.9999 | 1.0000 |

$P_i$ - Total number of trips produced in zone i

$A_j$ - Number of trips attracted to zone j

$F_{ij}$ - A value which is an inverse function of travel time

$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(20 Marks)

## Question 04

An inter-urban mode choice study has been undertaken for people with a choice between car and rail. The figures below were obtained as a result of a survey on five origin-destination pairs A to E.

Table Q4: Survey results

| | Elements of cost by each mode | | | | |
|---|---|---|---|---|---|
| | Car | | Rail | | |
| O–D | $X_1$ | $X_2$ | $X_1$ | $X_2$ | Proportion choosing car |
| A | 3.05 | 9.90 | 2.50 | 9.70 | 0.80 |
| B | 4.05 | 13.10 | 2.02 | 14.00 | 0.51 |
| C | 3.25 | 9.30 | 2.25 | 8.60 | 0.57 |
| D | 3.50 | 11.20 | 2.75 | 10.30 | 0.71 |
| E | 2.45 | 6.10 | 2.04 | 4.70 | 0.63 |

Where, $X_1$ is the travel time (in hours) and $X_2$ the out-of-pocket cost (in rupees). Assume the 'value of time' coefficient as 2.00 units per hour.

a) Calculate the generalized cost of travelling by each mode.

(09 Marks)

b) Calibrate a Binary Logit modal-split model with these data.

(10 Marks)

c) An improved rail service is to be introduced which will reduce travel times by 0.20 of an hour in every journey; by how much could the rail mode increase its fares without losing customers at each O–D pair?

(06 Marks)

## Question 05

Given a flow of six (6) units from origin "o" to destination "r". Flow on each route *ab* is designated with $Q_{ab}$ in the Time Function. Apply Wardrop's Network Equilibrium Principle (Users Equalize Travel Times on all used routes)

a) What is the flow and travel time on each link? Complete the Table Q5-a for the network.

Table Q5-a: Table to be completed

| Link | Link Performance | Flow | Time |
|---|---|---|---|
| o-p | $C_{op} = 5 * Q_{op}$ | | |
| p-r | $C_{pr} = 25 + Q_{pr}$ | | |
| o-q | $C_{oq} = 20 + 2 * Q_{oq}$ | | |
| q-r | $C_{qr} = 5 * Q_{qr}$ | | |

(12 Marks)

b) What is the system optimal assignment?

(08 Marks)

c) What is the Price of Anarchy?

(05 Marks)

## Question 06

The arrival rate A(t) and the departure rate B(t) of the vehicles to a park are given by the following function.

$A(t) = 2.2+0.17t- 0.0032t^2$

$B(t) = 1.2+ 0.07t$

These rates are deterministic but change over time (t).

a) Calculate the time of queue dissipation.

(07 Marks)

b) Calculate the length of the longest queue and its time of occurrence.

(13 Marks)

c) Calculate the average vehicle delay at park.

(05 Marks)

## Question 07

Write short notes for the following:

a) Comparison of simple random sampling versus stratified random sampling in transport modeling
b) Assumptions before running a multiple linear regression for modeling trip generation
c) Modeling qualitative variables in modal split.
d) The relationship between flow and density for highway traffic flow
e) Quality improvements to public transport systems in Sri Lanka

(05 Each X 05= Total 25 Marks)

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

# *t* Table

| cum. prob | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| one-tail | 0.50 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.001 | 0.0005 |
| two-tails | 1.00 | 0.50 | 0.40 | 0.30 | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.002 | 0.001 |
| df | | | | | | | | | | | |
| 1 | 0.000 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 0.000 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | 0.000 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | 0.000 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | 0.000 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | 0.000 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | 0.000 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | 0.000 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | 0.000 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | 0.000 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | 0.000 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | 0.000 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | 0.000 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | 0.000 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | 0.000 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | 0.000 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | 0.000 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | 0.000 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | 0.000 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | 0.000 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | 0.000 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | 0.000 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | 0.000 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | 0.000 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | 0.000 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | 0.000 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | 0.000 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | 0.000 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | 0.000 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | 0.000 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 40 | 0.000 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 60 | 0.000 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 80 | 0.000 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 100 | 0.000 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 1000 | 0.000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| *z* | 0.000 | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| | 0% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.8% | 99.9% |
| | Confidence Level | | | | | | | | | | |

t-table.xls 7/14/2007

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Year 4 Semester I

SEMESTER END EXAMINATION

Modelling in Transport and Logistics – LTML4202

- This paper consists of SEVEN (07) questions on THIRTEEN (13) pages.
- Answer FOUR (04) 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.
- Students' t-table is attached.

Date: 2019.09.15 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

Fill in the blanks using suitable terms commonly applicable in transport modeling.

1) .....attempts to replicate the system of interest and its behavior by means of mathematical equations based on certain theoretical statements about it.
2) The demand for transport is ....., it is not an end in itself. With the possible exception of sightseeing, people travel in order to satisfy a need (work, leisure, health) undertaking an activity at particular locations.
3) Transport is a ..... and not a good. Therefore, it is not possible to stock it, for example, to use it in times of higher demand. A transport service must be consumed when and where it is produced, otherwise its benefit is lost
4) ..... is the degree to which a measurement or model result matches true or accepted values.

5) ..... refers to the level or units of measurement used to collect data and deliver model outputs

6) ..... is a collection of units which has been especially selected to represent a larger population with certain attributes of interest (i.e. height, age, income).

7) ..... which is at the heart of the sample size estimation problem, postulates that the estimates of the mean from a sample tend to become distributed Normal as the sample size (n) increases.

8) ..... is a one-way movement from a point of origin to a point of destination

9) It is often convenient to use a measure combining all the main attributes related to the disutility of a journey and this is normally referred to as the ..... This is typically a linear function of the attributes of the journey weighted by coefficients which attempt to represent their relative importance as perceived by the traveler. One possible representation of this for mode k is (omitting superscript k for simplicity):

10) Trips which have their either origin or destination end as home are called .....

11) Trips may be made by different methods or modes of travel and the determination of the choice of travel mode is known as .....

12) The Gravity Model for trip distribution gets its name from the fact that it is conceptually based on Newton's law of _____.

(1.5X12 =18 Marks)

**Part B**

Choose the best alternative for each question

Take an example the following trip generation model using a multiple linear regression analysis. The dependent variable is number of trips generated by a zone in the study area (Y). The explanatory variables are monthly income of the traveler ($X_1$) and the number of cars owned by each household ($X_2$)in the same zone in the study area.

01) The primary objective of using regression analysis in modeling trip generation
   (A) To estimate the mean value of the dependent variable (total number of trips generated by a zone in the study area)
   (B) To estimate the mean value of the explanatory variable such as monthly income of the traveler of the zone in the study area
   (C) To estimate the correlation coefficient between the dependent variable (total number of trips generated by a zone in the study area) and the monthly income of the traveler of the zone in the study area
   (D) To estimate the mean value of the fixed variable such as the population of the zone in the study area.

02) In this regression analysis, the values are fixed for
   (A) Number of trips generated
   (B) Mean value of the number of trips generated
   (C) Monthly income and the number of cars owned by household
   (D) None of the above

03) Regression analysis is concerned with the study of dependence of

(A) Monthly income on number of trips generated

(B) Number of trips generated on monthly income and number of cars owned by a household

(C) Both number of trips generated and monthly income on number of cars owned

(D) None of the above

04) Regression analysis

(A) Necessarily imply that trip generation is caused by monthly income and car ownership.

(B) Does not necessarily imply that trip generation is caused by monthly income and car ownership.

(C) Always analyses the cause effect scenario between trip generation and monthly income

(D) Imply correlation effects among variables

05) In correlation analysis we measure the

(A) Degree of linear association between two variables

(B) Degree of causation between two variables

(C) Predictability of the two variables

(D) Regression between the two variables

06) Studying the dependence of trip generation on income is known as

(A) One variable regression analysis

(B) Simple linear regression analysis

(C) Three variables regression analysis

(D) Multiple linear regression analysis

07) Variables such as monthly income (Rs.75,000.00) and gender (male) are examples of

(A) Ratio scale and interval scale respectively

(B) Ratio scale and nominal scale respectively

(C) Ordinal scale and nominal scale

(D) Interval scale and ordinal scale

(1X7 Marks)

## Question 02

(a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (04 Marks)

(b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

(i) Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers. (03 Marks)

(ii) Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (02 Marks)

(c) Describe two (02) types of errors possible in transport modeling. (08 Marks)

(d) Describe two (02) methods used to collect data in transport modeling projects. (08 Marks)

## Question 03

(a) State four (04) factors affecting freight trip generation of a manufacturing plant. (04 Marks)

(b) Consider a zone with the following characteristics

Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(08 Marks)

(c) Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{(2.5)}{0.50} + \underset{(6.9)}{2.0x_1} + \underset{(5.6)}{1.5x_2} \quad R^2 = 0.589$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

(i) Choose one of the models explaining clearly the reasoning behind your decision.

(04 Marks)

(ii) If a zone has 1000 households (with an average of two workers per household), of which 50% has no cars, 35% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone, with both models. Discuss your results.

(06 Marks)

(d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(03 Marks)

## Question 04

(a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

Hint - assume that you have collected data to represent monthly travel behaviour of the passengers. Only procedures need to be discussed

(06 Marks)

(b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(06 Marks)

(c) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q4-c1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-c2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

Table Q4-c3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.
$P_i$ - Total number of trips produced in zone i
$A_j$ - Number of trips attracted to zone j
$F_{ij}$ - A value which is an inverse function of travel time
$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(13 Marks)

## Question 05

(a) A mode choice survey has been undertaken on a corridor connecting four residential areas A, B, C and D with three employment areas U, V and W. The corridor is served by a good rail link and a reasonable road network. The three employment zones are in a heavily congested area and therefore journeys by rail there are often faster than by car. The information collected during the survey is summarized below:

Table Q5-a: Survey information

| O–D pair | By car | | | | By rail | | | Proportion by car |
|---|---|---|---|---|---|---|---|---|
| | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_1$ | $X_2$ | $X_3$ | |
| A–U | 23 | 3 | 120 | 40 | 19 | 10 | 72 | 0.82 |
| B–U | 20 | 3 | 96 | 40 | 17 | 8 | 64 | 0.80 |
| C–U | 18 | 3 | 80 | 40 | 14 | 10 | 28 | 0.88 |
| D–U | 15 | 3 | 68 | 40 | 14 | 12 | 20 | 0.95 |
| A–V | 26 | 4 | 152 | 60 | 23 | 10 | 104 | 0.72 |
| B–V | 19 | 4 | 96 | 60 | 18 | 9 | 72 | 0.90 |
| C–V | 14 | 4 | 60 | 60 | 11 | 9 | 36 | 0.76 |
| D–V | 12 | 4 | 56 | 60 | 12 | 11 | 28 | 0.93 |
| A–W | 30 | 5 | 160 | 80 | 25 | 10 | 120 | 0.51 |
| B–W | 20 | 5 | 100 | 80 | 16 | 8 | 92 | 0.56 |
| C–W | 15 | 5 | 64 | 80 | 12 | 9 | 36 | 0.58 |
| D–W | 10 | 5 | 52 | 80 | 8 | 9 | 24 | 0.64 |

Where the costs per trip per passenger are as follows:
$X_1$ =in-vehicle travel time in minutes (line haul plus feeder mode, if any)
$X_2$ =excess time (walking plus waiting) in minutes
$X_3$ =out-of-pocket travel costs (petrol or fares), in pence
$X_4$ =parking costs associated with a one way trip, in pence.

Calibrate a Logit modal-split model assuming that the value of travel time is 8 rupees per minute and that the value of excess time is twice as much.

(25 Marks)

## Question 06)

(a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

**Highway Network:**

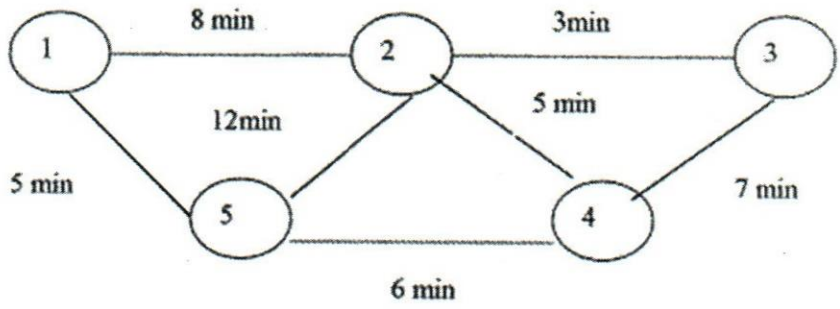


Figure Q6-a: Highway network

(10 Marks)

(b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

(i) Fit a linear equation relating trip generation rate and household size.

(10 Marks)

(ii) Test whether there is a linear relationship between number of trips generated and household size. Assume a reliable significance value.

(05 Marks)

Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

Hint:

For a linear equation y = a + bx

$$b=\frac{n\sum xy-\sum x\sum y}{n\sum x^2-(\sum x)^2}$$

## Question 07

Given a flow of six (6) units from origin "o" to destination "r". Flow on each route *ab* is designated with $Q_{ab}$ in the Time Function. Apply Wardrop's Network Equilibrium Principle (Users Equalize Travel Times on all used routes)

(a) What is the flow and travel time on each link? Complete the Table Q5-a for the network.

Table Q5-a: Table to be completed

| Link | Link Performance | Flow | Time |
|---|---|---|---|
| o-p | $C_{op} = 5 * Q_{op}$ | | |
| p-r | $C_{pr} = 25 + Q_{pr}$ | | |
| o-q | $C_{oq} = 20 + 2 * Q_{oq}$ | | |
| q-r | $C_{qr} = 5 * Q_{qr}$ | | |

(08 Marks)

(b) What is the system optimal assignment?

(12 Marks)

(c) What is the Price of Anarchy?

(05 Marks)

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

# *t* Table

| cum. prob | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **one-tail** | **0.50** | **0.25** | **0.20** | **0.15** | **0.10** | **0.05** | **0.025** | **0.01** | **0.005** | **0.001** | **0.0005** |
| **two-tails** | **1.00** | **0.50** | **0.40** | **0.30** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.002** | **0.001** |
| **df** | | | | | | | | | | | |
| 1 | 0.000 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 0.000 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | 0.000 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | 0.000 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | 0.000 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | 0.000 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | 0.000 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | 0.000 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | 0.000 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | 0.000 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | 0.000 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | 0.000 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | 0.000 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | 0.000 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | 0.000 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | 0.000 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | 0.000 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | 0.000 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | 0.000 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | 0.000 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | 0.000 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | 0.000 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | 0.000 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | 0.000 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | 0.000 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | 0.000 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | 0.000 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | 0.000 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | 0.000 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | 0.000 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 40 | 0.000 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 60 | 0.000 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 80 | 0.000 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 100 | 0.000 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 1000 | 0.000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| ***z*** | 0.000 | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| | 0% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.8% | 99.9% |
| | **Confidence Level** | | | | | | | | | | |

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Department of Logistics & Transport
BSc (Hons.) in Logistics and Transportation
Course CODE: COM551

00020

Year 4 Semester I
SEMESTER END EXAMINATION
Strategic Management – LTSM4206

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer FOUR 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: 2019.09.01 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

You are working as a Planning Manager for an FMCG company that operates across 05 FMCG categories with a range of brands. You have been approached by the board of directors to analyse each category and comment on future implications.

- Toothpaste – Overall market for dental care is increasing and the company owns two leading toothpaste brands of the country.
- Instant Noodle – This is also one of the fast-growing industries due to changing lifestyle and the company recently entered this segment with a new brand. Two multinational companies dominate this market with two global brands.
- Rice - This industry is maturing with a reducing market growth rate. The company recently acquired the leadings packaged rice brand.
- Detergent - This market is also maturing with a reducing market growth rate. The company owns the leading detergent brand of the country.
- Biscuit – This is a high growth market in Sri Lanka that is dominated by two local brands, The Company recently entered this industry with a new biscuit brand.

(a) Select an appropriate portfolio model and place the above SBU's. Comment on the market position of each of these segments. (12 Marks)

(b) Do you think this company has a balanced portfolio? Explain your answer highlighting future implications.

(13 Marks)

## Question 02

Sri Lankan higher education industry has undergone a number of reform efforts and changes over the past 2-3 decades. Currently, it characterized by intense competition between government universities, other government educational institutions and private sector organisations that offer both locally and globally recognized academic, vocational and professional qualifications.

(a) Analyse the macro environmental changes and challenges that affect Sri Lankan Higher education Industry with an appropriate model or framework.

(12 Marks)

(b) Identify and explain 03 key macro environmental challenge and their implications for private universities. (13 Marks)

## Question 03

(a) Explain four growth strategies available for a business organization using Ansoff's matrix with appropriate examples.

(12 Marks)

(b) Identify and explain 04 main reasons for diversifications with appropriate examples.

(13 Marks)

## Question 04

Strategies can be applied at different levels of the organisation.

(a) Explain the different levels of strategy with appropriate examples.

(12 Marks)

(b) What are the different modes of strategic decision making? Explain your answer with example. (13 Marks)

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## Question 05

(a) Critically assess the bases of achieving competitive advantage for a company/ business unit in terms of 'routes' on the Bowman's strategy clock. Your answer need to suggest examples for each route.

(12 Marks)

(b) 'Structure follows strategy' Elaborate this statement with relevant industry examples.

(13 Marks)

## Question 06

(a) What is meant by National Advantage? How it is different from competitive advantage? (12 Marks)

(b) Explain the key determinants of National Advantage (Porter's Diamond Model) with appropriate global examples.

(13 Marks)

## Question 07

(a) What is meant by Globalisation. Explain your answer highlighting key changes before and after globalisation?

(12 Marks)

(b) Identify and briefly explain 03 drivers and 03 barriers for innovation.

(13 Marks)

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

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Year 4 Semester I

SEMESTER END EXAMINATION

# Inventory and warehouse Management – LTIM4203

- This paper consists of SEVEN questions on SIX (06) pages.
- Answer FOUR 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 documents are attached to the question paper.

Date: 2019.09.08 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

### Dynamic Inventory Control

Automotive manufacturing is like a well-planned athletic competition. Every play needs to be designed and executed flawlessly by each member of the team. For one leading international automaker, increasing the efficiency of inbound-to-manufacturing materials flow was the fundamental step in driving peak production performance.

The company needed an integrated solution to manage dynamic inventory levels through each step of the process and effectively coordinate just-in-time deliveries. And with three different production processes, 22 suppliers and 300 part numbers, that was no small task.

A tailor-made, web-based, supplier integration system was introduced to support common manufacturing operations — such as delivery sequencing, metering and replenishments of open-bin supplies — for inbound-to-manufacturing automotive

environments. It links all of the company's global supply chain partners into a flexible, real-time production schedule that streamlines information flow and reduces waste. With support and training at both the implementation and ongoing operation stages, the system provides much-needed visibility and inventory control.

(a) Explain the logistics challenge faced by the automaker in the case study. (08 Marks)

(b) Elaborate on how a supplier integration system helped the company achieve its objectives. (08 Marks)

(c) What are the benefits of dynamic inventory control for a manufacturing or assembly operation. (09 Marks)

## Question 02

Home Grow is a company that imports indoor plant growing units with the popularity of urban farming in Sri Lanka and estimates demand to be approximately 2,400 units. Buying price of a unit is $ 35 and the monthly holding cost is 3% of unit's value. It costs approximately $25 to place an order. Home Grow currently orders 100 units twice a month.

(a) What is the total cost for the current order quantity? (06 Marks)

(b) What is the economic order quantity (EOQ)? (06 Marks)

(c) How many orders will be placed per year using the EOQ? (06 Marks)

(d) Determine the ordering, holding, and total inventory costs for the EOQ. How has the total cost changed? (07 Marks)

## Question 03

Upon closer observation, Home Grow determines that the demand is normally distributed with standard deviation of demand 4 units per day. (Home Grow is open 300 days per year.) It usually takes about 4 days to receive an order through air freight from the factory in China.

(a) What is the safety stock needed to achieve a service level of 94%? What is the holding cost associated with this safety stock?

(10 Marks)

(b) What is the reorder point? (07 Marks)

(c) How would the reorder point change, if the service level changed to 99%?

(08 Marks)

## Question 04

(a) List at least three types of inventory. (05 Marks)

(b) What is month-end counting? (05 Marks)

(c) What is "Warehousing as a strategic Asset" concept? (05 Marks)

(d) Explain put-away in warehousing? (05 Marks)

(e) What is the rationale for Vendor Managed Inventory? (05 Marks)

## Question 05

(a) "In today's marketplace, the order-winning criteria is more likely to be service based than product-based".

Elaborate on the above statements with an appropriate industry example.

(12 Marks)

(b) "E-commerce offers countless opportunities as well as a great challenge for logistics"

Elaborate on the above statement with examples with special attention to order fulfillment. (13 Marks)

## Question 06

(a) Explain how ABC classification can be used in the context of a supermarket store with examples. (10 Marks)

(b) "Collaborative logistics is making the way companies do logistics".

Support above statement in the context of collaborative warehousing with examples. (15 Marks)

## Question 07

(a) What are the advantages of point-of-use stock storage? Briefly explain the role of packaging. (12 Marks)

(b) What is break bulk in warehousing? (08 Marks)

(c) What are the benefits of warehousing? (05 Marks)

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

**Attachment 1**
Equations

$$Q = \sqrt{\frac{2DS}{H}}$$

$$TC_{EOQ} = \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right)$$

*Where*

$TC$ = total annual cost

$D$ = annual demand

$Q$ = quantity to be ordered

$H$ = annual holding cost

$S$ = ordering or setup cost

$$R = dL$$

where $R$ = reorder point in units

$d$ = daily/weekly demand in units

$L$ = lead time in days/weeks

$$R = dL + SS$$

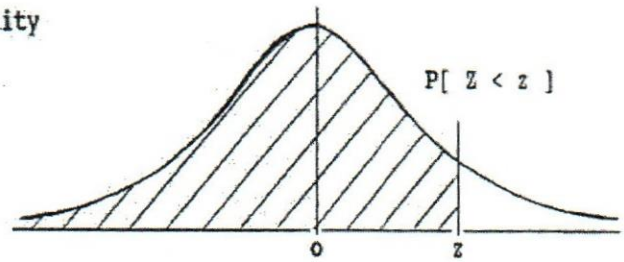
where $SS$ = safety stock in units

# STANDARD STATISTICAL TABLES

## 1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z

i.e. $$P[\ Z < z\ ] = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-\tfrac{1}{2}Z^2)\ dZ$$




| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5159 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7854 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8804 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9773 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9865 | 0.9868 | 0.9871 | 0.9874 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9924 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9980 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| z | 3.00 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 | 3.60 | 3.70 | 3.80 | 3.90 |
| P | 0.9986 | 0.9990 | 0.9993 | 0.9995 | 0.9997 | 0.9998 | 0.9998 | 0.9999 | 0.9999 | 1.0000 |

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Year 4 Semester I
RE PEAT EXAMINATION
Strategic Management – LTSM4206

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer FOUR 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: 2018.12.04 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

You are working as a strategist for a group of companies that operates in 04 different industries with four separate strategic business units. You have been approached by the board of directors to analyse each SBU and comment on the future implications.

- Education - This is one of the fast-growing industries of the country, and the company recently entered this industry with a joint venture with a foreign university.
- Leisure – This is also one of the fast-growing industries that grew rapidly after the war. The company is still a new entrant with two small hotels.
- Retailing– The overall market growth rate has decreased (low) due to reduced consumptions. The company owns the leading supermarket chain in the country.
- IT – This is one of the fast-growing industries of the country, and the company recently entered this industry by acquiring the leading IT firm.

(a) Select an appropriate portfolio model and place the above SBU's. Comment on the market position of each of these segments. (13 Marks)

(b) Do you think this company has a balanced portfolio? Explain your answer highlighting the limitations of portfolio management.

(12 Marks)

## Question 02

ABC is a Sri Lankan company manufacturing a wide range of FMCG products consisting of detergents, foods and carbonated soft drinks. However, recently the management noticed that the carbonated soft drink sales have stagnated and profits are starting to fall.

(a) What would be the possible reasons for the decrease in sales of carbonated soft drinks? (13 Marks)

(b) Recommend and justify two strategic options available for ABC to reverse the soft drink sales trend and remain strong and competitive in the soft drink market. (12 Marks)

## Question 03

"The term 'Strategy' is one of the keywords widely used in the business world".

(a) Identify and briefly explain the three levels of strategy with examples. (13 Marks)

(b) Explain the modes of strategic decision making with examples. (12 Marks)

## Question 04

The term strategic management is used to refer to the entire scope of strategic-decision making activity in an organization.

(a) Identify and explain the key elements of strategic management? (13 marks)

(b) Explain the differences between strategic management and operational management with examples. (12 marks)

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## Question 05

You have been appointed as the Chief Executive Officer of a firm that plans start its operations soon. As a part of the process of deciding philosophical options for the design of strategies, you have been approached by the board of directors to clarify followings.

(a) The main idea behind the porter's three generic strategies framework.
(13 Marks)

(b) Compare and contrast the three generic strategies with real-world examples.
(12 Marks)

## Question 06

(a) What do you understand by the term 'Change Management'? Why is it considered one of the key aspects of strategic management?
(13 Marks)

(b) What is the difference between 'Competitive Advantage' and 'National Advantage'? Explain your answer with appropriate models and frameworks
(12 Marks)

## Question 07

(a) What do you understand by the term 'Globalisation'? Why is it considered as one of the key challenges of strategic management?
(13 Marks)

(b) What are the main barriers for innovation? Briefly explain your answer with examples.
(12 Marks)

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

# Colombo International Nautical and Engineering College

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Course CODE: COM551

## Year 4 Semester I
## REPEAT EXAMINATION
## Modeling in Transport and Logistics – LTML4203

- This paper consists of SEVEN questions on EIGHT (08) pages.
- Answer FOUR 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: 2018.12.03 Pass mark: 50% Time: 02 Hours

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## Question 01: (Compulsory)

(a) State three (03) characteristics of demand for transport. (03 Marks)

(b) Describe three (03) elements of transport system. (03 Marks)

(c) Define the following terminologies commonly used in statistics.
(i) Data
(ii) Sample
(iii) Population of interest (06 Marks)

(d) Briefly describe the four interconnected processes in planning transportation. (07 Marks)

(e) Describe the instance for the equilibrium that could happen for demand and supply for transport. (06 Marks)

## Question 02

(a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (02 Marks)

(b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

(i) Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers. (03 Marks)

(ii) Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (03 Marks)

(c) Describe two (02) types of errors possible in transport modeling. (08 Marks)

(d) Describe two (02) methods used to collect data in transport modeling projects. (06 Marks)

(e) Describe a practical consideration in sampling. (03 Marks)

## Question 03

(a) State four (04) factors affecting freight trip generation of a manufacturing plant. (04 Marks)

(b) Consider a zone with the following characteristics

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Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(08 Marks)

(c) Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{(2.5)}{0.50} + \underset{(6.9)}{2.0x_1} + \underset{(5.6)}{1.5x_2} \quad R^2 = 0.589$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

(i) Choose one of the models explaining clearly the reasoning behind your decision.

(05 Marks)

(ii) If a zone has 1000 households (with an average of two workers per household), of which 50% has no cars, 35% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone, with both models. Discuss your results.

(06 Marks)

(d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(02 Marks)

## Question 04

(a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

Hint - assume that you have collected data to represent monthly travel behaviours of the passengers,
Only procedures need to be discussed

(04 Marks)

(b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(05 Marks)

(c) Briefly explain the Gravity Distribution Model to model trip distributions.
(Hint - A possible scenario can be assumed and only singly constrained trip distribution can be thought of)

(06 Marks)

(d) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q4-d1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-d2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

Table Q4-d3. Travel Time versus Friction Factor

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| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.
$P_i$ - Total number of trips produced in zone i
$A_j$ - Number of trips attracted to zone j
$F_{ij}$ - A value which is an inverse function of travel time
$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(10 Marks)

## Question 05

(a) State briefly the content of discrete choice model.

(03 Marks)

(b) Briefly explain the random utility theory commonly applicable in discrete choice models.

(06 Marks)

(c) A mode choice survey has been undertaken on a corridor connecting four residential areas A, B, C and D with three employment areas U, V and W. The

corridor is served by a good rail link and a reasonable road network. The three employment zones are in a heavily congested area and therefore journeys by rail there are often faster than by car. The information collected during the survey is summarized below:

Table Q5-c: Survey information

| | By car | | | | By rail | | | |
|---|---|---|---|---|---|---|---|---|
| **O–D pair** | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_1$ | $X_2$ | $X_3$ | **Proportion by car** |
| A–U | 23 | 3 | 120 | 40 | 19 | 10 | 72 | 0.82 |
| B–U | 20 | 3 | 96 | 40 | 17 | 8 | 64 | 0.80 |
| C–U | 18 | 3 | 80 | 40 | 14 | 10 | 28 | 0.88 |
| D–U | 15 | 3 | 68 | 40 | 14 | 12 | 20 | 0.95 |
| A–V | 26 | 4 | 152 | 60 | 23 | 10 | 104 | 0.72 |
| B–V | 19 | 4 | 96 | 60 | 18 | 9 | 72 | 0.90 |
| C–V | 14 | 4 | 60 | 60 | 11 | 9 | 36 | 0.76 |
| D–V | 12 | 4 | 56 | 60 | 12 | 11 | 28 | 0.93 |
| A–W | 30 | 5 | 160 | 80 | 25 | 10 | 120 | 0.51 |
| B–W | 20 | 5 | 100 | 80 | 16 | 8 | 92 | 0.56 |
| C–W | 15 | 5 | 64 | 80 | 12 | 9 | 36 | 0.58 |
| D–W | 10 | 5 | 52 | 80 | 8 | 9 | 24 | 0.64 |

Where the costs per trip per passenger are as follows:
$X_1$ =in-vehicle travel time in minutes (line haul plus feeder mode, if any)
$X_2$ =excess time (walking plus waiting) in minutes
$X_3$ =out-of-pocket travel costs (petrol or fares), in pence
$X_4$ =parking costs associated with a one way trip, in pence.

Calibrate a Logit modal-split model assuming that the value of travel time is 8 rupees per minute and that the value of excess time is twice as much.

(16 Marks)

## Question 06

(a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

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| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

Highway Network:

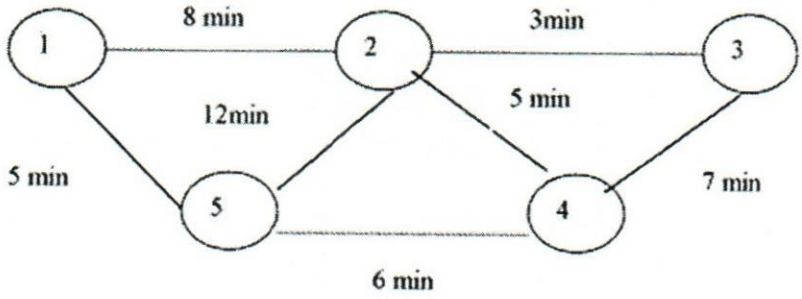


Figure Q6-a: Highway network

(12 Marks)

(b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

(i) Fit a linear equation relating trip generation rate and household size.

(10 Marks)

(ii) Test whether there is a linear relationship between number of trips generated and household size. Assume a reliable significance value.

(03 Marks)

Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

## Question 07

Given a flow of six (6) units from origin "o" to destination "r". Flow on each route *ab* is designated with $Q_{ab}$ in the Time Function. Apply Wardrop's Network Equilibrium Principle (Users Equalize Travel Times on all used routes)

(a) What is the flow and travel time on each link? Complete the Table Q5-a for the network.

Table Q5-a: Table to be completed

| Link | Link Performance | Flow | Time |
|---|---|---|---|
| o-p | $C_{op} = 5 * Q_{op}$ | | |
| p-r | $C_{pr} = 25 + Q_{pr}$ | | |
| o-q | $C_{oq} = 20 + 2 * Q_{oq}$ | | |
| q-r | $C_{qr} = 5 * Q_{qr}$ | | |

(10 Marks)

(b) What is the system optimal assignment?

(10 Marks)

(c) What is the Price of Anarchy?

(05 Marks)

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

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Year 4 Semester I
SEMESTER END EXAMINATION
Strategic Management – LTSM4206

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer FOUR 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: 2018.07.21 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

You are working as a strategist for a diversified company that operates in 06 different industries with six separate strategic business units. You have been approached by the board of directors to analyse each SBU and comment on the future implications.

- Footwear - Sri Lankan footwear industry is becoming highly fragmented with the influx of small manufacturers and importers. However, the company is the leading footwear manufacturer and the overall market growth rate is still increasing.
- Construction – This is also one of the fast-growing industries that grew rapidly after the war. The company is the undisputed market leader in the industry and involved in a range of construction projects.
- Hotel – This is one of the fast-growing industries of the country after the war, and the company is a new entrant with two small boutique hotels.
- Retailing– The overall market growth rate has decreased (low) due to reduced consumptions. The company recently acquired the leading supermarket chain in the country.
- Telecommunication – This is one of the fast-growing industries of the country, and the company recently entered this industry with a joint venture with a new foreign firm.

- IT – This industry is maturing with a reducing industry growth rate. The company/ SBU owns the two leading IT brands in the country.

(a) Select an appropriate portfolio model and place the above SBU's. Comment on the market position of each of these segments. (13 Marks)

(b) Do you think this company has a balanced portfolio? Explain your answer highlighting the limitations of portfolio management. (12 Marks)

## Question 02

Sri Lanka remains favourable for retail trading being placed at 12 according to the Global Index report with even some developed countries like the Philippines below. Sri Lanka's total retail trade was US$ 31 billion in 2015 but came down in 2016 to $30 billion according to the A.T. Kearney Global Index. Nevertheless, it has huge potential amidst the macro and meso challenges it faces including the emergence of global e-commerce giants.

*(Source: www.sundaytimes.lk)*

(a) Analyse the macro environmental changes and challenges that affect Sri Lankan Retail Industry with an appropriate model or framework. (13 Marks)

(b) Identify and explain 03 key macro environmental challenge and their implications for local retail chains. (12 Marks)

## Question 03

(a) Explain the different types of strategies with examples. (13 Marks)

(b) Strategy can be seen in different ways. Evaluate this statement using the concept of five P's of strategy. (12 Marks)

## Question 04

Every organisation should operate with a clear purpose.

(a) Distinguish between vision and mission with examples. (13 Marks)

(b) What are the key differences between strategic management and operational management? Explain your answer with examples. (12 Marks)

## Question 05

(a) Explain the Porter's Three generic Strategic with practical examples. (13 marks)

(b) What is the main idea behind Porter's Diamond model (Determinants of National Advantage)? Explain your answer highlighting the key components of the model. (12 marks)

## Question 06

(a) Select a business organisation of your choice and identify 06 main stakeholder groups and their influences. (13 Marks)

(b) Assess/ prioritize these stakeholders with an appropriate model or framework. (12 Marks)

## Question 07

(a) Explain the concept of balanced score card using a hypothetical example. (13 Marks)

(b) What are the main barriers for innovation? Briefly explain your answer with examples. (12 Marks)

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

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Year 4 Semester I
SEMESTER END EXAMINATION
Modeling in Transport and Logistics – LTML4202

- This paper consists of SEVEN questions on NINE (09) pages.
- Answer FOUR 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: 2018.07.07 Pass mark: 50% Time: 02 Hours

## Question 01

Fill in the blanks using appropriate words. (Use the answer scripts provided)

(a) A ..... is a simplified representation of a part of the real world–the system of interest–which focuses on certain elements considered important from a point of view.

(b) Models attempt to replicate the system of interest and its behavior by means of mathematical equations based on certain ..... statements about it.

(c) The demand for transport is ..... It is not an end on its own.

(d) ..... is the degree to which a measurement or model result matches true or accepted values.

(e) ..... refers to the level or units of measurement used to collect data and deliver model outputs.

(f) ..... which is at the heart of the sample size estimation problem, postulates that the estimates of the mean from a sample tend to become distributed Normal as the sample size (n) increases.

(g) ..... does not affect the expected values of the means of the estimated parameters; it only affects the variability around them, thus determining the degree of confidence that may be associated with the means; it is basically a function of sample size and the inherent variability of the parameter under investigation.

(h) ..... is caused by mistakes made either when defining the population of interest, or when selecting the sampling method, the data collection technique or any other part of the process.

(i) The ..... is defined as a collection of units which has been especially selected to represent a larger population with certain attributes of interest.

(j) ..... is a one-way movement from a point of origin to a point of destination.

(k) It is often convenient to use a measure combining all the main attributes related to the disutility of a journey and this is normally referred to as the ..... This is typically a linear function of the attributes of the journey weighted by coefficients which attempt to represent their relative importance as perceived by the traveler.

(l) ..... models estimate trips for each cell in the matrix without directly using the observed trip pattern. Therefore, they are sometimes called synthetic as opposed to growth factor models.

(m) The Gravity Model for trip distribution gets its name from the fact that it is conceptually based on Newton's law of .....

(n) Trip ..... attempts to determine the connection between trip making and land use factors.

(o) Degree of ..... association between two variables can be measured by correlation analysis.

(p) Ratio, interval, ordinal and ..... are the four types of scales of measurement of variables.

(q) ..... is the study of the dependence of an explanatory variable on one or more predictor variables with the view to estimate the mean or average value of the explanatory variable using the fixed or known values of the predictor variables.

(r) Trips may be made by different methods or modes of travel and the determination of the choice of travel mode is known as .....

(s) The binary ..... is used to estimate the probability of a binary response based on one or more predictor (or independent) variables.

(t) ..... concerns the selection of routes (alternative called paths) between origins and destinations in transportation networks.

(25 Marks)

## Question 02

(a) State each advantages and limitation of the following methods of modeling trip generation.

(i) Regression analysis

(ii) Category analysis

(06 Marks)

(b) Consider the following trip attraction models estimated using a standard computing package (t-ratios are given in parentheses):

$$Y = 123.2 + 0.89X_1 \qquad R^2 = 0.90$$

(5.2) (7.3)

$$Y = 40.1 + 0.14X_2 + 0.61X_3 + 0.25X_4 \qquad R^2 = 0.925$$

(6.4) (1.9) (2.4) (1.8)

$$Y = -1.7 + 2.57X_1 - 1.78X_2 \qquad R^2 = 0.996$$

(-0.6) (9.9) (-9.3)

Where Y is the work trips attracted to the zone, $X_1$ is total employment in the zone, $X_2$ is industrial employment in the zone, $X_3$ is commercial employment in the zone and $X_4$ is service employment.

Choose the most appropriate model, clearly explaining all its pros and cons.

(10 Marks)

(c) The Table Q2-c1 presents some data collected in the last household O-D survey (made ten years ago) for three particular zones:

Table Q2-c1: O-D survey results for three zones

| Zone | Residents /Household | Workers/Household | Mean income | Population |
|---|---|---|---|---|
| I | 2.0 | 1.0 | 50,000 | 20,000 |
| II | 3.0 | 2.0 | 70,000 | 60,000 |
| III | 2.5 | 2.0 | 100,000 | 100,000 |

Ten years ago, two household-based trip generation models were estimated using this data. The first was a linear regression model given by:

$$y = 0.2 + 0.5x_1 + 1.1Z_1 \quad R^2 = 0.78$$

where $y$ is household peak hour trips, $x_1$ is the number of workers in the household and $Z_1$ is a dummy variable which takes the value of 1 for high income (> 70,000) households and 0 in other cases.

The second was a category analysis model based on two income strata (low and high income) and two levels of family structure (1 or less and 2 or more workers per household). The estimated trip rates are given in the Table Q2-c2.

Table Q2-c2: O-D Estimated trip rates

| Family structure | Income | |
|---|---|---|
| | Low | High |
| 1 or less | 0.8 | 1.0 |
| 2 or more | 1.2 | 2.3 |

If the total number of trips generated today during the peak hour by the three zones are given in Table Q2-c3.

Table Q2-c3: Total trips generated today by three zones

| Zone | Peak hour trips |
|---|---|
| I | 8,200 |
| II | 24,300 |
| III | 92,500 |

It is also estimated that the zone characteristics (income, number of households and family structure) have remained stable. Decide which model is the best. Explain your answer.

(09 Marks)

## Question 03

(a) Briefly compare growth factor and gravity models in trip distribution.

(05 Marks)

(b) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q3-b1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 250 | 450 | 300 | 1000 |
| Trip Attractions | 395 | 180 | 425 | 1000 |

Table Q3-b2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 6 | 4 | 2 |
| 2 | 2 | 8 | 3 |
| 3 | 1 | 3 | 5 |

Table Q3-b3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 13 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ – Number of trips that are produced in zone i and attracted to zone j.

$P_i$ - Total number of trips produced in zone i

$A_j$ - Number of trips attracted to zone j

$F_{ij}$ - A value which is an inverse function of travel time

$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(20 Marks)

## Question 04

An inter-urban mode choice study has been undertaken for people with a choice between car and rail. The figures below were obtained as a result of a survey on five origin-destination pairs A to E.

Table Q4: Survey results

| | Elements of cost by each mode | | | | |
|---|---|---|---|---|---|
| | Car | | Rail | | |
| O-D | $X_1$ | $X_2$ | $X_1$ | $X_2$ | Proportion choosing car |
| A | 3.05 | 9.90 | 2.50 | 9.70 | 0.80 |
| B | 4.05 | 13.10 | 2.02 | 14.00 | 0.51 |
| C | 3.25 | 9.30 | 2.25 | 8.60 | 0.57 |
| D | 3.50 | 11.20 | 2.75 | 10.30 | 0.71 |
| E | 2.45 | 6.10 | 2.04 | 4.70 | 0.63 |

Where, $X_1$ is the travel time (in hours) and $X_2$ the out-of-pocket cost (in rupees). Assume the 'value of time' coefficient as 2.00 units per hour.

(a) Calculate the generalized cost of travelling by each mode.

(07 Marks)

(b) Calibrate a Binary Logit modal-split model with these data.

(11 Marks)

(c) An improved rail service is to be introduced which will reduce travel times by 0.20 of an hour in every journey; by how much could the rail mode increase its fares without losing customers at each O-D pair?

(07 Marks)

## Question 05

Given a flow of six (6) units from origin "o" to destination "r". Flow on each route *ab* is designated with $Q_{ab}$ in the Time Function. Apply Wardrop's Network Equilibrium Principle (Users Equalize Travel Times on all used routes)

(a) What is the flow and travel time on each link? Complete the Table Q5-a for the network.

Table Q5-a: Table to be completed

| Link | Link Performance | Flow | Time |
|---|---|---|---|
| o-p | $C_{op} = 5 * Q_{op}$ | | |
| p-r | $C_{pr} = 25 + Q_{pr}$ | | |
| o-q | $C_{oq} = 20 + 2 * Q_{oq}$ | | |
| q-r | $C_{qr} = 5 * Q_{qr}$ | | |

(10 Marks)

(b) What is the system optimal assignment?

(10 Marks)

(c) What is the Price of Anarchy?

(05 Marks)

## Question 06

The arrival rate A(t) and the departure rate B(t) of the vehicles to a park are given by the following function.

$A(t) = 2.2+0.17t- 0.0032t^2$

$B(t) = 1.2+ 0.07t$

These rates are deterministic but change over time (t).

(a) Calculate the time of queue dissipation.

(06 Marks)

(b) Calculate the length of the longest queue and its time of occurrence.

(13 Marks)

(c) Calculate the average vehicle delay at park. (06 Marks)

## Question 07

Write short notes for the following:

(a) Comparison of simple random sampling versus stratified random sampling in transport modeling

(b) Assumptions before running a multiple linear regression for modeling trip generation

(c) Modeling qualitative variables in modal split.

(d) The relationship between flow and density for highway traffic flow

(e) Quality improvements to public transport systems in Sri Lanka

(5X5 Marks)

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

# Colombo International Nautical and Engineering College

CINEC Campus
Faculty of Management, Humanities and Social Sciences
Department of Logistics & Transport
BSc (Hons.) in Logistics and Transportation
Course CODE: COM551

Year 4 Semester I
REPEAT EXAMINATION
Modeling in Transport and Logistics – LTML4202

- This paper consists of SEVEN questions on EIGHT (08) pages.
- Answer FOUR 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.
- Supporting documents will be provided.

Date: 2017.11.04 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

(a) State three (03) characteristics of demand for transport. (03 Marks)

(b) Traffic congestion in road is highly influenced by the level of transport supply and demand. Briefly explain the term 'congestion' in terms of traffic flow and travel time using the figure Q1-b given below.

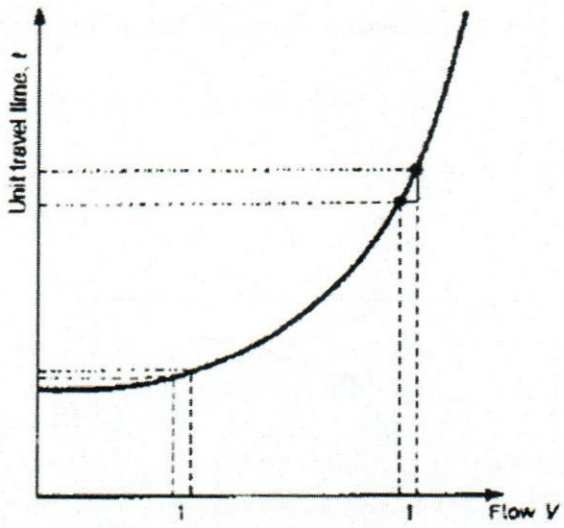


Figure Q1-b: Defining traffic congestion

(06 Marks)

(c) "We can find a set of equilibrium points for a transport system between transport supply and transport demand. But again there would be changes in level of service as to the changes in activity levels. Hence we would need to find two equilibrium points one for the short term and next for the long term".

Based on the above concept, explain the below mentioned statement 'The task of Transport Planning is to forecast and manage these equilibrium points so that the welfare of the society is maximized.'

(03 Marks)

(d) Briefly describe the four interconnected processes in planning transportation.
(08 Marks)

(e) Describe the instance for the equilibrium that could happen for demand and supply for transport. (05 Marks)

## Question 02

(a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (04 Marks)

(b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

(i) Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers.

(ii) Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (06 Marks)

(c) Describe two (02) types of errors possible in transport modeling. (06 Marks)

(d) Describe two (02) methods used to collect data in transport modeling projects.

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(e) Describe a practical consideration in sampling. (06 Marks)

(03 Marks)

## Question 03

(a) State four (04) factors affecting freight trip generation of a manufacturing plant. (04 Marks)

(b) Consider a zone with the following characteristics

Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(08 Marks)

(c) Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{}{0.50} + \underset{(2.5)}{2.0x_1} + \underset{(6.9)}{1.5x_2} \quad R^2 = 0.589 \qquad (5.6)$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

(i) Choose one of the models explaining clearly the reasoning behind your decision.

(04 Marks)

(ii) If a zone has 1000 households (with an average of two workers per household), of which 50% has no cars, 35% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone, with both models. Discuss your results.

(06 Marks)

(d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(03 Marks)

## Question 04

(a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

Hint - assume that you have collected data to represent monthly travel behaviours of the passengers,
Only procedures need to be discussed

(04 Marks)

(b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(06 Marks)

(c) Briefly explain the Gravity Distribution Model to model trip distributions.
(Hint - A possible scenario can be assumed and only singly constrained trip distribution can be thought of)

(05 Marks)

(d) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

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Table Q4-d1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-d2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

Table Q4-d3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.
$P_i$ - Total number of trips produced in zone i
$A_j$ - Number of trips attracted to zone j
$F_{ij}$ - A value which is an inverse function of travel time
$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(10 Marks)

## Question 05

(a) State briefly the content of discrete choice model.

(02 Marks)

(b) Briefly explain the random utility theory commonly applicable in discrete choice models.

(02 Marks)

(c) A mode choice survey has been undertaken on a corridor connecting four residential areas A, B, C and D with three employment areas U, V and W. The corridor is served by a good rail link and a reasonable road network. The three employment zones are in a heavily congested area and therefore journeys by rail there are often faster than by car. The information collected during the survey is summarized below:

Table Q5-c: Survey information

| | By car | | | | By rail | | | |
|---|---|---|---|---|---|---|---|---|
| O–D pair | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_1$ | $X_2$ | $X_3$ | Proportion by car |
| A–U | 23 | 3 | 120 | 40 | 19 | 10 | 72 | 0.82 |
| B–U | 20 | 3 | 96 | 40 | 17 | 8 | 64 | 0.80 |
| C–U | 18 | 3 | 80 | 40 | 14 | 10 | 28 | 0.88 |
| D–U | 15 | 3 | 68 | 40 | 14 | 12 | 20 | 0.95 |
| A–V | 26 | 4 | 152 | 60 | 23 | 10 | 104 | 0.72 |
| B–V | 19 | 4 | 96 | 60 | 18 | 9 | 72 | 0.90 |
| C–V | 14 | 4 | 60 | 60 | 11 | 9 | 36 | 0.76 |
| D–V | 12 | 4 | 56 | 60 | 12 | 11 | 28 | 0.93 |
| A–W | 30 | 5 | 160 | 80 | 25 | 10 | 120 | 0.51 |
| B–W | 20 | 5 | 100 | 80 | 16 | 8 | 92 | 0.56 |
| C–W | 15 | 5 | 64 | 80 | 12 | 9 | 36 | 0.58 |
| D–W | 10 | 5 | 52 | 80 | 8 | 9 | 24 | 0.64 |

Where the costs per trip per passenger are as follows:
$X_1$ =in-vehicle travel time in minutes (line haul plus feeder mode, if any)
$X_2$ =excess time (walking plus waiting) in minutes
$X_3$ =out-of-pocket travel costs (petrol or fares), in pence
$X_4$ =parking costs associated with a one way trip, in pence.

(i) Calibrate a Logit modal-split model assuming that the value of travel time is 8 rupees per minute and that the value of excess time is twice as much.

(03 Marks)

(ii) Estimate the impact on modal split on each O-D pair of an increase in petrol prices which doubles the perceived cost of running a car ($X_3$).

(09 Marks)

(iii) Estimate the shift in modal split which could be obtained if no fares were charged on the rail system.

(09 Marks)

## Question 06)

(a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

Highway Network:

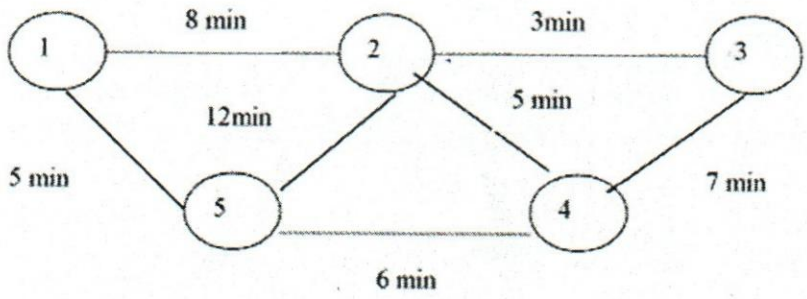


Figure Q6-a: Highway network

(12 Marks)

(b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

(i) Fit a linear equation relating trip generation rate and household size.

(10 Marks)

(ii) Test whether there is a linear relationship between number of trips generated and household size. Assume a reliable significance value.

(03 Marks)

Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

## Question 07

Write short notes for the following:

(a) Comparison of simple random sampling versus stratified random sampling in transport modeling
(b) Assumptions before running a multiple linear regression for modeling trip generation
(c) Modeling qualitative variables in modal split.
(d) The relationship between flow and density for highway traffic flow
(e) Quality improvements to public transport systems in Sri Lanka

(5*5 Marks)

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

# *t* Table

| cum. prob | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| one-tail | 0.50 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.001 | 0.0005 |
| two-tails | 1.00 | 0.50 | 0.40 | 0.30 | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.002 | 0.001 |
| df | | | | | | | | | | | |
| 1 | 0.000 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 0.000 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | 0.000 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | 0.000 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | 0.000 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | 0.000 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | 0.000 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | 0.000 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | 0.000 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | 0.000 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | 0.000 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | 0.000 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | 0.000 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | 0.000 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | 0.000 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | 0.000 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | 0.000 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | 0.000 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | 0.000 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | 0.000 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | 0.000 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | 0.000 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | 0.000 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | 0.000 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | 0.000 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | 0.000 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | 0.000 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | 0.000 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | 0.000 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | 0.000 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 40 | 0.000 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 60 | 0.000 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 80 | 0.000 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 100 | 0.000 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 1000 | 0.000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| *z* | 0.000 | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| | 0% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.8% | 99.9% |
| | Confidence Level | | | | | | | | | | |

Colombo International Nautical and Engineering College
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Department of Logistics & Transport
BSc in International Transportation Management and Logistics
Course CODE: COM550

Year 4 Semester I
REPEAT EXAMINATION
Strategic Supply Chain Management – SCMG0349

- 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.
- Supporting documents are attached to the question paper.

Date: 2017.05.20 Pass mark: 50% Time: 03 Hours

## Question 01: (Compulsory)

**A Closer Look: Supply Chain Risk in the Food Industry**

Today's food value chain perfectly illustrates the need for resiliency. In the past, most food companies dealt with supply chain risk after-the-fact through product recalls—and by switching suppliers once problems were detected. In an increasingly complex marketplace, the traditional approach just isn't good enough. Tracing a food problem back to its source is complicated by multi-tiered supply networks and divergent standards for food quality and safety around the world. For example, various countries that produce rice allow different levels of arsenic (which is used to control pests). This means that rice may be deemed safe and legal to sell in one market but not in others.

Regulations and standards are continually evolving and present a challenging risk. In the U.S., for instance, federal lawmakers are expanding the authority of the Food and Drug Administration to include the ability to shut down operations that fail to comply with the

law. Food companies may soon face the real risk of being put out of business, as opposed to simply conducting a recall, which many food companies were willing to live with as a cost of doing business. A more challenging risk is food fraud and economic adulteration. Effective risk management in this context requires more than a general understanding of supply chain risks or the ability to change suppliers. It requires an in-depth scientific knowledge of ingredients, packaging and manufacturing processes that drive food quality and safety. Verification of foreign suppliers, including an assessment of their food defense measures, is an essential mitigation strategy that protects consumers and the bottom line.

(a) Explain supply chain risk with an example. (02 Marks)

(b) Why is it important for an organization to manage supply chain risk effectively? (04 Marks)

(c) Elaborate on how supplier evaluation can be used in supply chain risk mitigation. (06 Marks)

(d) Visibility & collaboration are key pillars in achieving resilience in supply chain, explain how to improve supply chain resiliency through visibility & collaboration across the supply chain. (08 Marks)

## Question 02

(a) Write a short essay on the topic:

"E-commerce offers countless opportunities as well as a great challenge for logistics" (07 Marks)

(b) "What gets measured, gets managed"-Peter Ducker.

Elaborate on the importance of performance metrics using appropriate examples.

(06 Marks)

(c) Discuss the importance of managing "last mile" & "the perfect order" for supply chain success in the context of FMCG sector in Sri Lanka. (07 Marks)

## Question 03

The Lanka Autozone Pvt. Ltd. producers Tail Lights for the newly opened, V.W Automobile Assembly Plant in Sri Lanka. About 55,000 pairs of tail lights (two tail lights for back) are ordered by the auto assembly company per annum, at a price of $150.00 per pair. The auto assembly company operates 280 days per year and places orders of 2000 pairs on a fortnight basis to cover its demand. It costs $ 3.00 to store one pair of Tail Lights for one month and the ordering cost is 0.2% of the order value.

(a) What is the total cost for the current order quantity? (05 Marks)

(b) What is the economic order quantity (EOQ)? (05 Marks)

(c) How many orders will be placed per year using the EOQ? (05 Marks)

(d) Determine the ordering, holding, and total inventory costs for the EOQ. How has the total cost changed? (05 Marks)

## Question 04

It takes about 2 days to receive an order from The Lanka Autozone Pvt. Ltd. and the demand has a standard deviation of 15 units per day.

(a) What is the safety stock needed to achieve a service level of 94%? What is the holding cost associated with this safety stock? (06 Marks)

(b) What is the reorder point? (06 Marks)

(c) How would the reorder point change, if the service level changed to 98%? (08 Marks)

## Question 05

(a) What is the rationale for Vendor Managed Inventory? (04 Marks)

(b) Explain the concept of total cost of ownership with an example. (04 Marks)

(c) Explain lean as a supply chain strategy. (04 Marks)

(d) Explain triple bottom line approach in sustainability. (04 Marks)

(e) Identify three functions of inventory and explain one of them. (04 Marks)

## Question 06

(a) Compare & contrast the terms "logistics management" & "supply chain management". (05 Marks)

(b) A recent business report highlighted that the main measure of performance used by most purchasing functions was 'Cost Reduction'.
Propose other sets of performance measures that could be applied by purchasing functions to assess their contribution to corporate performance. (08 Marks)

(c) Explain with an appropriate examples, how the changing competitive environment effects on supply chain management (07 Marks)

## Question 07

(a) Explain how ABC analysis can be used in the context of procurement. (05 Marks)

(b) Discuss how RFID can be used in warehouse management to improve operational efficiency. (07 Marks)

(c) Discuss how collaborative forecasting can be used to minimize the effects of bull-whip effect & enhance supply chain performance with an example. (08 Marks)

## Question 08

(a) "Strategic sourcing is a key asset in enhancing supply chain performance"
Support above statement with examples. (06 Marks)

(b) Identify and explain four global supply chain challenges with examples. (06 Marks)

(c) Discuss the three phases of supply chain network planning with an appropriate example. (08 Marks)

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

**Attachment 1**
Equations

$$Q = \sqrt{\frac{2DS}{H}}$$

$$TC_{EOQ} = \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right)$$

*Where*

$TC$ = total annual cost

$D$ = annual demand

$Q$ = quantity to be ordered

$H$ = annual holding cost

$S$ = ordering or setup cost

$$R = dL$$

where $R$ = reorder point in units

$d$ = daily/weekly demand in units

$L$ = lead time in days/weeks

$$R = dL + SS$$

where $SS$ = safety stock in units

01;12

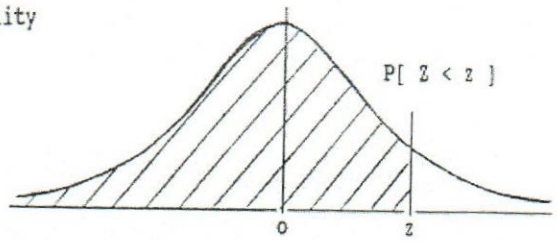
**Attachment 2**

## STANDARD STATISTICAL TABLES

### 1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z
i.e.

$$P[\ Z < z\ ] = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-\tfrac{1}{2}Z^2)\, dZ$$




| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5159 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7854 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8804 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9773 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9865 | 0.9868 | 0.9871 | 0.9874 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9924 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9980 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| z | 3.00 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 | 3.60 | 3.70 | 3.80 | 3.90 |
| P | 0.9986 | 0.9990 | 0.9993 | 0.9995 | 0.9997 | 0.9998 | 0.9998 | 0.9999 | 0.9999 | 1.0000 |

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Year 4 Semester I

REPEAT EXAMINATION

# Foreign Trade Insurance – FTIN0335

- 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: 2017.05.20 Pass mark: 50% Time: 03 Hours

## Question 01: (Compulsory)

(a) What is meant by "Insurable Interest"? (06 marks)

(b) Explain "Insurance Interest", in relation to Main Cargo Insurance. (14 Marks)

## Question 02

"Geographical factors and Natural Phenomenon effects overseas trade". Explain this statement. (20 Marks)

## Question 03

State the susceptibility of the following cargos to loss or damage during sea voyage and suggest ways to mitigate them. (5*4 Marks)

(a) Coal

(b) Liquor

(c) Fresh Fruits

(d) Motor Vehicle parts

## Question 04

(a) Explain the term "Export Credit Insurance". (08 marks)

(b) Discuss in detail, the commercial and non-commercial risk covered under Export Credit Insurance. (12 marks)

## Question 05

Write Short Notes on **Any Four** of the following topics (5*4 Marks)

(a) Salvage Charges

(b) Airway Bill

(c) Total Loss and Constructive Total Loss

(d) Voyage Policy

(e) Open Policy

## Question 06

(a) List down six (6) perils which may cause losses/ damages to cargo during a sea voyage (06 Marks)

(b) List down six (6) types of dangerous/ hazardous cargo (06 Marks)

(c) State five (5) factors that insurer will take into consideration when underwriting cargo risks. (08 Marks)

## Question 07

"Types of insurance in foreign trade may differ in relation to the terms used in trading between the parties to a carriage contract". Discuss the important INCORTERMS and their relevance to varying insurance policies that need to be present in multi model transportation. (20 Marks)

## Question 08

(a) Identify the advantages in using containerized transportation (08 marks)

(b) Name eight hazards involved in containerized transits (08 marks)

(c) What are the insurance covers available for containerized cargo? (04 marks)

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

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Course CODE: COM551

Year 4 Semester I
SEMESTER END EXAMINATION
Inventory and Warehouse Management – LTIM4203

- This paper consists of SEVEN questions on TWO (02) pages.
- Answer FOUR 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: 2017.07.16 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

A distributor for a tire company expects to sell 9,600 steel-belted radial tires of a certain size and tread design next year. Annual carrying cost is Rs. 16 per tire, and ordering cost is Rs. 75. The distributor operates 288 days a year.

(a) What is the EOQ? (05 Marks)
(b) How many times per year does the store reorder? (06 Marks)
(c) What is the length of an order cycle? (07 Marks)
(d) What is the total annual cost if the EOQ quantity is ordered? (07 Marks)

## Question 02

Myriah Fitzgibbon, uses 1,200 of a certain spare part that costs Rs.25 for each order with an annual holding cost of Rs 24.

(a) Calculate the total cost for order sizes of 25, 40, 50, 60, and 100. (10 Marks)
(b) Identify the economic order quantity and consider the implications for making an error in calculating economic order quantity. (15 Marks)

## Question 03

(a) Identify four main objectives of warehousing. (04 Marks)
(b) Briefly explain the role of the warehouse. (09 Marks)
(c) Briefly explain four benefits of warehouse management. (12 Marks)

## Question 04

(a) Identify five main types of warehousing in operational. (05 Marks)
(b) Briefly explain warehousing as a strategic asset. (08 Marks)
(c) Discuss the strategic warehousing. (12 Marks)

## Question 05

(a) What are the five main factors should be considered when designing warehouse. (05 Marks)
(b) Briefly explain two types of costs of operating warehouse. (08 Marks)
(c) Briefly explain five main warehouse functions. (12 Marks)

## Question 06

(a) Identify four warehouse operating principles. (04 Marks)
(b) Briefly explain two main types of stock locations in warehousing. (10 Marks)
(c) Explain three orders picking and assembly systems. (11 Marks)

## Question 07

(a) Briefly explain two types of packaging. (06 Marks)
(b) Briefly explain the role of packaging. (09 Marks)
(c) Briefly explain ~~four types of packaging~~ three main KPIs of Warehousing. (10 Marks)

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

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BSc (Hons.) in Logistics and Transportation
Course CODE: COM551

Year 4Semester I
SEMESTER END EXAMINATION
Strategic Management – LTSM 4206

- This paper consists of SEVEN questions on THREE (03) pages.
- Answer FOUR 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: 2017.07.22 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

Even though there is a widespread and growing concern in fast food and restaurant industry with regard to the quality and service, Sri Lankan fast-food and restaurant industry is one of the fast-growing sectors of the economy. On a macroeconomic level, a range of social, economic and cultural factors and changes have contributed to this growth.

(a) Analyse the macro environment changes and challenges that affect Sri Lankan fast-food and restaurant industry with an appropriate model or framework (15 Marks)

(b) Identify and explain 02 key macro-environmental challenges and their implications on local fast food companies and restaurants. (10 Marks)

## Question 02

"The term 'Strategy' is broad concept that covers a range of aspects and related concepts.

(a) Identify and explain the types of strategy with examples. (15 Marks)

(b) Differentiate three levels of strategy with examples (10 Marks)

## Question 03

You have been appointed as a strategist for a group of company that operates in 04 different areas namely,

Hotel – This is one of the fast growing industries of the country after the war and the company is a new entrant with two small boutique hotels.
Construction – This is also one of the lucrative and fast-growing industries of the country after the war. The company is the undisputed leader in the construction industry.
Fashion - Sri Lankan fashion industry is becoming highly fragmented with a range of small players. The company recently entered the market with a small share and the overall market growth rate is still increasing.
Education – The Company recently entered into this industry with an affiliation with a foreign university. This is also a high growth industry.

(a) Select an appropriate portfolio model and place the above SBU's. (05 Marks)
(b) Comment on the market position of each of these segments. (10 Marks)
(c) Do you think this company has a balanced portfolio? Briefly, justify your answer. (10 Marks)

## Question 04

(a) Explain the Porter's Three generic Strategic with practical examples (15 Marks)
(b) What is meant by 'National Advantage'? Explain your answer with appropriate models and frameworks. (10 Marks)

## Question 05

(a) What are the key elements of the Corporate Strategy and how does corporate strategy differ from competitive strategy? (15 Marks)
(b) Explain the o4 growth strategies with examples (10 Marks)

## Question 06

(a) Explain the balanced score card technique with a hypothetical example.

(15 Marks)

(b) What are the main problems associated with implementation?

(10 Marks)

## Question 07

Write short notes on any **FIVE** of the following wit examples:

(a) Strategic wear out and draft

(b) Transnational strategy

(c) Barriers to change

(d) Reasons for vertical integration

(e) Strategy as a perspective

(f) Globalization

(g) Strategic fit

(5*5 Marks)

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

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Year 4 Semester I
SEMESTER END EXAMINATION
Modeling in Transport and Logistics – LTML4202

- This paper consists of SEVEN questions on EIGHT (08) pages.
- Answer FOUR 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.
- Supporting documents will be provided.

Date: 2017.07.15 Pass mark: 50% Time: 02 Hours

## Question 01: (Compulsory)

(a) State three (03) characteristics of demand for transport. (03 Marks)

(b) Describe three (03) elements of transport system. (06 Marks)

(c) Define the following terminologies commonly used in statistics.
(i) Data
(ii) Sample
(iii) Population of interest
(03 Marks)

(d) Briefly describe the four interconnected processes in planning transportation. (08 Marks)

(e) Describe the instance for the equilibrium that could happen for demand and supply for transport. (05 Marks)

## Question 02

(a) Briefly explain two (02) features of transport models to be taken into consideration while specifying an analytical approach. (04 Marks)

(b) Assume that for the purposes of a transport study the population of a certain area has been classified according to two income categories, and that there are only two modes of transport available (car and bus) for the journey to work.

Let us also assume that the population distribution is given by:

Table Q2-b: Population distribution

| | Low income | High income | Total |
|---|---|---|---|
| Bus user | 0.45 | 0.15 | 0.60 |
| Car user | 0.20 | 0.20 | 0.40 |
| Total | 0.65 | 0.35 | 1.00 |

(i) Calculate the probability of a low-income traveler using bus when a sample is with 75% low income (LI) and 25% high income (HI) travelers.

(ii) Calculate the probability of a bus user having low income when a sample is of 75% bus users and 25% car users. (06 Marks)

(c) Describe two (02) types of errors possible in transport modeling. (06 Marks)

(d) Describe two (02) methods used to collect data in transport modeling projects. (06 Marks)

(e) Describe a practical consideration in sampling. (03 Marks)

## Question 03

(a) State four (04) factors affecting freight trip generation of a manufacturing plant. (04 Marks)

(b) Consider a zone with the following characteristics

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Table Q3-b. Zone characteristics

| Household type | No. | Income ($/month) | Inhabitants | Trips/day |
|---|---|---|---|---|
| 0 cars | 180 | 4 000 | 4 | 6 |
| 1 car | 80 | 18 000 | 4 | 8 |
| 2 or more cars | 40 | 50 000 | 6 | 11 |

Due to a decrease in import duties and a real income increase of 30% it is expected that in five years' time 50% of households without a car would acquire one. Estimate how many trips the zone would generate in that case.

(08 Marks)

(c) Consider the following two morning peak work trip generation models estimated by households linear regression. (t-ratios are given in parentheses)

$$y = \underset{(2.5)}{0.50} + \underset{(6.9)}{2.0x_1} + \underset{(5.6)}{1.5x_2} \quad R^2 = 0.589$$

$$y = \underset{(0.9)}{0.01} + \underset{(4.6)}{2.3x_1} + \underset{(1.9)}{1.1z_1} + \underset{(3.4)}{4.1z_2} \quad R^2 = 0.601$$

where y are household trips to work in the morning peak, $x_1$ is the number of workers in the household, $x_2$ is the number of cars in the household, $z_1$ is a dummy variable which takes the value of 1 if the household has one car and $z_2$ is a dummy which takes the value of 1 if the household has two or more cars.

(i) Choose one of the models explaining clearly the reasoning behind your decision.

(04 Marks)

(ii) If a zone has 1000 households (with an average of two workers per household), of which 50% has no cars, 35% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone, with both models. Discuss your results.

(06 Marks)

(d) Explain briefly the pros and cons of growth factor modeling in trip generation.

(03 Marks)

## Question 04

(a) If the generalized cost is measured in money units then is sometimes interpreted as the value of time (or more precisely the value of in-vehicle time) as its units are Rupees/time.

Briefly describe about the methodology that you would carry out to estimate the value of time of the passengers in the Galle road between Fort and Moratuwa .

Hint - assume that you have collected data to represent monthly travel behaviours of the passengers,
Only procedures need to be discussed

(04 Marks)

(b) Explain two each advantages and limitations of growth factor methods in modeling trip distribution.

(06 Marks)

(c) Briefly explain the Gravity Distribution Model to model trip distributions.
(Hint - A possible scenario can be assumed and only singly constrained trip distribution can be thought of)

(05 Marks)

(d) A study area consists of three zones. The data have been determined as shown in the following Tables. Assume $K_{ij} = 1$.

Table Q4-d1. Zone Productions and Attractions

| Zone | 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Trip Productions | 140 | 330 | 280 | 750 |
| Trip Attractions | 300 | 270 | 180 | 750 |

Table Q4-d2. Travel Time between zones (min)

| Zone | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 2 | 6 | 6 |
| 3 | 3 | 6 | 5 |

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Table Q4-d3. Travel Time versus Friction Factor

| Time (min) | F |
|---|---|
| 1 | 82 |
| 2 | 52 |
| 3 | 50 |
| 4 | 41 |
| 5 | 39 |
| 6 | 26 |
| 7 | 20 |
| 8 | 12 |

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}}\right]$$

$T_{ij}$ - Number of trips that are produced in zone i and attracted to zone j.
$P_i$ - Total number of trips produced in zone i
$A_j$ - Number of trips attracted to zone j
$F_{ij}$ - A value which is an inverse function of travel time
$K_{ij}$ - Socio economic adjustment factor for interchange ij

Determine the number of trips between each zone using the gravity model formula and the data given above.

(10 Marks)

## Question 05

(a) State briefly the content of discrete choice model.

(02 Marks)

(b) Briefly explain the random utility theory commonly applicable in discrete choice models.

(02 Marks)

(c) A mode choice survey has been undertaken on a corridor connecting four residential areas A, B, C and D with three employment areas U, V and W. The corridor is served by a good rail link and a reasonable road network. The three employment zones are in a heavily congested area and therefore journeys by rail there are often faster than by car. The information collected during the survey is summarized below:

Table Q5-c: Survey information

| | By car | | | | By rail | | | |
|---|---|---|---|---|---|---|---|---|
| **O–D pair** | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_1$ | $X_2$ | $X_3$ | **Proportion by car** |
| A–U | 23 | 3 | 120 | 40 | 19 | 10 | 72 | 0.82 |
| B–U | 20 | 3 | 96 | 40 | 17 | 8 | 64 | 0.80 |
| C–U | 18 | 3 | 80 | 40 | 14 | 10 | 28 | 0.88 |
| D–U | 15 | 3 | 68 | 40 | 14 | 12 | 20 | 0.95 |
| A–V | 26 | 4 | 152 | 60 | 23 | 10 | 104 | 0.72 |
| B–V | 19 | 4 | 96 | 60 | 18 | 9 | 72 | 0.90 |
| C–V | 14 | 4 | 60 | 60 | 11 | 9 | 36 | 0.76 |
| D–V | 12 | 4 | 56 | 60 | 12 | 11 | 28 | 0.93 |
| A–W | 30 | 5 | 160 | 80 | 25 | 10 | 120 | 0.51 |
| B–W | 20 | 5 | 100 | 80 | 16 | 8 | 92 | 0.56 |
| C–W | 15 | 5 | 64 | 80 | 12 | 9 | 36 | 0.58 |
| D–W | 10 | 5 | 52 | 80 | 8 | 9 | 24 | 0.64 |

Where the costs per trip per passenger are as follows:
$X_1$ =in-vehicle travel time in minutes (line haul plus feeder mode, if any)
$X_2$ =excess time (walking plus waiting) in minutes
$X_3$ =out-of-pocket travel costs (petrol or fares), in pence
$X_4$ =parking costs associated with a one way trip, in pence.

(i) Calibrate a Logit modal-split model assuming that the value of travel time is 8 rupees per minute and that the value of excess time is twice as much.

(03 Marks)

(ii) Estimate the impact on modal split on each O–D pair of an increase in petrol prices which doubles the perceived cost of running a car ($X_3$).

(09 Marks)

(iii) Estimate the shift in modal split which could be obtained if no fares were charged on the rail system.

(09 Marks)

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## Question 06

(a) Assign the vehicle trips shown in the following O-D trip table (Q6-a) to the network shown in figure Q6-a, using the all-or-nothing assignment technique.

Table Q6-a: Origin-Destination Trip table

| | Trips between Zones | | | | |
|---|---|---|---|---|---|
| **From/to** | **1** | **2** | **3** | **4** | **5** |
| 1 | - | 100 | 100 | 200 | 150 |
| 2 | 400 | - | 200 | 100 | 500 |
| 3 | 200 | 100 | - | 100 | 150 |
| 4 | 250 | 150 | 300 | - | 400 |
| 5 | 200 | 100 | 50 | 350 | - |

Highway Network:

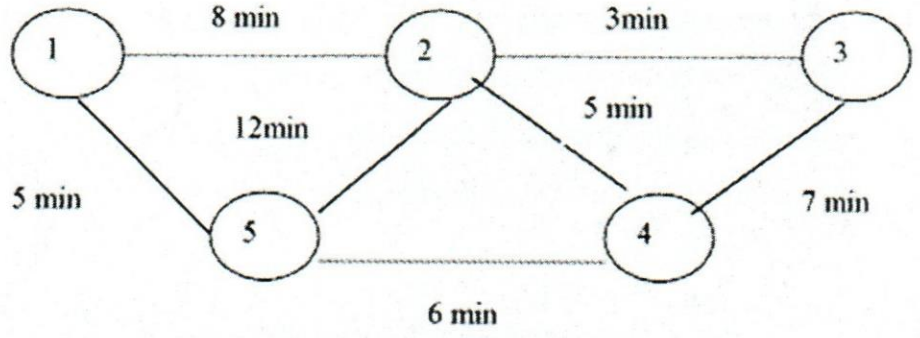


Figure Q6-a: Highway network

(12 Marks)

(b) Let the trip rate of a zone is explained by the household size in the field survey conducted. It was found that the household size is 1, 2, 3 and 4. The trip rates of the corresponding household are as shown in the table below.

(i) Fit a linear equation relating trip generation rate and household size.

(10 Marks)

(ii) Test whether there is a linear relationship between number of trips generated and household size. Assume a reliable significance value.

(03 Marks)

Table Q6-b: Survey information

| | Household size (x) | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| Trips per day (y) | 1 | 2 | 4 | 6 |
| | 2 | 4 | 5 | 7 |
| | 2 | 3 | 3 | 4 |
| $\sum y$ | 5 | 9 | 12 | 17 |

## Question 07

Write short notes for the following:

(a) Comparison of simple random sampling versus stratified random sampling

(b) Traffic congestion' in terms of traffic flow and travel time

(c) Wardrop's Principles of Equilibrium in traffic assignment

(d) The relationship between flow and density for highway traffic flow

(e) Quality improvements to public transport systems in Sri Lanka

(5*5 Marks)

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

# *t* Table

| cum. prob | $t_{.50}$ | $t_{.75}$ | $t_{.80}$ | $t_{.85}$ | $t_{.90}$ | $t_{.95}$ | $t_{.975}$ | $t_{.99}$ | $t_{.995}$ | $t_{.999}$ | $t_{.9995}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| one-tail | 0.50 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.001 | 0.0005 |
| two-tails | 1.00 | 0.50 | 0.40 | 0.30 | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.002 | 0.001 |
| df | | | | | | | | | | | |
| 1 | 0.000 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 0.000 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 22.327 | 31.599 |
| 3 | 0.000 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 10.215 | 12.924 |
| 4 | 0.000 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 7.173 | 8.610 |
| 5 | 0.000 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5.893 | 6.869 |
| 6 | 0.000 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.208 | 5.959 |
| 7 | 0.000 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 4.785 | 5.408 |
| 8 | 0.000 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 4.501 | 5.041 |
| 9 | 0.000 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.297 | 4.781 |
| 10 | 0.000 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.144 | 4.587 |
| 11 | 0.000 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.025 | 4.437 |
| 12 | 0.000 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 3.930 | 4.318 |
| 13 | 0.000 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 3.852 | 4.221 |
| 14 | 0.000 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 3.787 | 4.140 |
| 15 | 0.000 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 3.733 | 4.073 |
| 16 | 0.000 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 3.686 | 4.015 |
| 17 | 0.000 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.646 | 3.965 |
| 18 | 0.000 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.610 | 3.922 |
| 19 | 0.000 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.579 | 3.883 |
| 20 | 0.000 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.552 | 3.850 |
| 21 | 0.000 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.527 | 3.819 |
| 22 | 0.000 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.505 | 3.792 |
| 23 | 0.000 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.485 | 3.768 |
| 24 | 0.000 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.467 | 3.745 |
| 25 | 0.000 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.450 | 3.725 |
| 26 | 0.000 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.435 | 3.707 |
| 27 | 0.000 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.421 | 3.690 |
| 28 | 0.000 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.408 | 3.674 |
| 29 | 0.000 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.396 | 3.659 |
| 30 | 0.000 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.385 | 3.646 |
| 40 | 0.000 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.307 | 3.551 |
| 60 | 0.000 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.232 | 3.460 |
| 80 | 0.000 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.195 | 3.416 |
| 100 | 0.000 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.174 | 3.390 |
| 1000 | 0.000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| *z* | 0.000 | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| | 0% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.8% | 99.9% |
| | Confidence Level | | | | | | | | | | |