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CINEC CAMPUS(PVT)LTD
Faculty of Marine Engineering
Department of Marine Engineering
EDUCATION & TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I
COURSE CODE: ED 0350 PI (BATCH NO 47)

1ST SEMESTER EXAMINATION QUESTION PAPER
MARITIME LAW

- *This question paper consists of nine questions.*
- *Answer any SIX questions*

| *Date: 08.03.2024* | *Pass mark 50%* | *Time allocated: 03 Hrs* |

(1.) a) What is meant by Flag state?   (07 Marks)
      b) Briefly explain what is Class?   (07 Marks)
      c) What is the Tacit acceptance?   (06 Marks)

(2.) With reference to Annex I,
     a) What are the regulations when pumping out machinery spaces bilges in special areas.   (07 Marks)
     b) What certificates/ documents should be carried on board to comply with this annex?   (07 Marks)
     c) What are the special area under Annex I?   (06 Marks)

(3.) a) What are the requirements for pumping out sea water at sea?   (07 Marks)
      b) What are the items prohibited to burn in incinerator?   (06 Marks)
      c) What are the regulations for discharge food waste at sea?   (07 Marks)

(4.) a) Explain how ships engine exhaust gases cause air pollution?   (07 Marks)
      b) State what are the ozone depleting substances?   (07 Marks)
      c) Define emission control area with Sulphur percentage.   (06 Marks)

(5.) a) What is objective of SOLAS?   (05 Marks)

       b) What is non-combustible materials?   (05 Marks)

       c) What is standard fire set?   (05 Marks)

       d) What is the regulation for emergency generator?   (05 Marks)

(6.) With reference to ISPS Code,

       a)   What is a security level?   (06 Marks)

       b)   What is a security incident?   (04 Marks)

       c)   Briefly explain,

                   I.   SSO

                   II.   CSO

                   III.   Ship security plan.   (10 Marks)

(7.) a) Objective of ISM Code.   (06 Marks)

       b) What certificates are issued under ISM?   (04 Marks)

       c) What is major non-conformity and conformity?   (10 Marks)

(8.) With reference to MLC,

       a)   What is the objective of MLC?   (06 Marks)

       b)   What are the 05 titles of MLC?   (07 Marks)

       c)   What are the rest hour regulation?   (07 Marks)

(9.) With reference to STCW,

       a)   Write down of chapters.   (10 Marks)

       b)   What are the functions of STCW?   (06 Marks)

       c)   What are the levels?   (04 Marks)

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1ST SEMESTER EXAMINATION QUESTION PAPER
Thermodynamics

- *This question paper consists of Nine questions.*
- *Answer any SIX questions*

Date: 2024.03.07   Pass mark 50%   Time allocated: 03 Hrs

For air $c_p = 1.005kJ/kg\ K$, $c_v = 0.717kJ/kg\ K$, $\gamma = 1.4$

Composition of air (mass proportions): **77 % of Nitrogen** and **23 % of Oxygen**

Specific heat capacity of water **4.2 kJ/kg K,** Latent heat of evaporation of water **2.256 MJ/kg**

Specific heat capacity of ice **2.1 kJ/kg K,** Latent heat of fusion of ice **336 kJ/kg**

1.

   a. State the **Boyle's law** and **Charles' law** for perfect gases   (6 marks)

   b. Taking characteristic gas constant R for Nitrogen as **0.297 kJ/kg K**, Calculate

      i. The mass of **0.05 m^3** of nitrogen at **550 kPa** and **28 ^0C**   (4 marks)

      ii. The volume of **1 kg** of Nitrogen at **1 MPa** and **0 ^0C**   (4 marks)

   c. **0.25 m^3** of Nitrogen gas at **21^0C** is heated at constant pressure to a temperature of **315 ^0C**. calculate the initial pressure and the final volume   (6 marks)

2.

   a. State the First Law in thermodynamics   (3 marks)

   b. Describe the specific heat capacity of a gas   (5 marks)

   c. **0.5 kg** of air initially at **25 ^{0} C** and **2 bar** is occupied in a volume of **0.02 m^3**. The air sample is heated under constant pressure to **100 ^0C**. Then it is cooled under constant volume until its temperature is back to the initial value. Determine

      i. The final volume of air   (3 marks)

      ii. Work done during the heating process   (3 marks)

      iii. Heat transfer under constant pressure   (3 marks)

      iv. Heat transfer under constant volume   (3 marks)

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6.

a. Draw the Temperature -enthalpy diagram for water and steam to represent the following states on it

   i. Saturated liquid line, Wet vapour region, Saturated dry vapour line, Superheated vapour region and Critical point
      (5 marks)

   ii. Saturated water at *250.3 ^0C*, wet steam at *40 bar* with *0.95 dry, dry* steam at *20 bar* and steam at *20 bar* and *300 ^0C*
      (5 marks)

b. Steam enters to a super-heater at a pressure of *20 bar* and dryness *0.8* and steam leaves the super-heater at *300 ^0C*. Using the steam tables, find

   i. The specific enthalpy of change of steam in the super-heater   (5 marks)

   ii. The specific volume change of steam   (5 marks)

7.

a. Describe the none flow energy equation (**NFEE**)   (3 marks)

b. A gas expands in a closed system doing, *500 kJ* of work on the surroundings while *800 kJ* of heat are transferred to the system. Find the change in internal energy   .(3 marks)

c. A quantity of gas with a molecular mass of *20* occupies a volume of *0.04 m^3* at a pressure of *40 bar* and *1247 ^0C*. It is isentropically expanded from these conditions to a volume of *0.36 m^3* and pressure of *2.5 bar*. Determine

   i. The index of expansion   (4 marks)

   ii. The work transfer during the process   (4 marks)

   iii. The value of C_p and C_v for the gas   (6 marks)

8.

a. Some thermodynamic and transport properties of *refrigerant -404a* contain in the table below. Using the properties of vapour complete the table   (8 marks)

Pressure, bar	Saturation temperature, ^0C	Enthalpy, kJ/kg		
		h_f	h_{fg}	h_g
2.864	-22	170.2	181.7	....
2.974	-21	171.5	....	355.9
3.087	-20	....	183.8	356.5
13.926	29	244.5	....	381.9
14.150	30	....	136.1	382.2
14.654	31	247.9	134.7	....

b. **Refrigerant - 404a** uses to operate refrigerant in a reefer container plant. The saturated refrigerant liquid at **14.150 bar** in a receiver expands to a wet vapour at **2.974 bar** by a throttling valve.

    i.   Draw the Temperature-Enthalpy diagram for the expansion   (4 marks)

    ii.   Find the enthalpy after the expansion   (4 marks)

    iii.   Estimate the dryness fraction after the expansion   (4 marks)

Hint: Use the properties in the table given in the **part a**

9.

a. State the steady flow energy equation in full, defining the symbols and unit used

(5 marks)

b. Air passes through a gas turbine at the rate of **10 kg/s**. The gas enters the turbine with a velocity of **100 m/s** and specific volume of **0.68 m^3/kg**. The gas leaves the turbine with a specific volume of **1.85 m^3/kg**. The exit area of the turbine is **0.045 m^2**. In its passage through the turbine system, the specific enthalpy of air is reduced by **300 kJ/kg** and there is a heat transfer loss of **48 kJ/kg**. Determine

    i.   The inlet area of the turbine in m^2 (5 marks)

    ii.   The exit velocity of the air **m/s**   (5 marks)

    iii.   The power developed by the turbine system in **kW**   (5 marks)

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1ST SEMESTER EXAMINATION QUESTION PAPER
Workshop Theory (Batch 47)

- *This question paper consists of six questions.*
- *Answer All questions*

Date: 2024.03.06   Pass mark 50%   Time allocated: 03 Hrs

Q1. Briefly explain following workshop tools with their respective uses. You may use diagrams for explaining. (2.5 marks each)

   a. Depth micrometer.
   b. Vernier Caliper.
   c. Centre punch.
   d. Poker gauge.
   e. Crankshaft deflection gauge.
   f. Scriber
   g. Divider
   h. Planimeter

Q2   (i) Explain the difference between drilling and boring (2 marks)

   (ii) You are given a steel plate of 100mm X 80mm

   And 16mm thick. It is required to make a 10mm internal threaded hole at the Centre of above plate using all the necessary workshop tools including relevant tap set. Explain the procedure of making the above hole step by step. You may use sketches where necessary. (8 marks)

   (iii)   Make a sketch of treaded rod and name following measurements. Major diameter Minor diameter, Pitch and Pitch diameter (6 marks)

Q3. (a) (i) Explain MIG welding procedure and application (3 marks)

   (ii) Explain TIG welding procedure and application (3marks)

   (iii) Explain various welding positions using suitable sketches (3 marks)

List down 4 types of welding joints with sketches (3marks)

   (b) List down various types of welding faults. (4 marks)

Q4.

(i) With regard to properties of materials explain following terms. (2 marks each)

a. Ductility b. Hardness c. Toughness d. Brittleness

b. How to classify metallic and non-metallic material? (4 marks)

 b. Plane carbon steels are mainly made of iron with small quantities of carbon. Explain with examples following type of steel with their uses. Your answer should include the percentage of carbon in each type of steel.

 i. Low carbon steel (2 marks)

 ii. Medium carbon steel (2marks)

 iii. High carbon steel (2marks)

 iv. What is meant by cast iron? Give some examples of engineering components manufactured by cast iron. What are the advantages and disadvantage of using cast iron? (2 marks)

Q5. With the aid of a suitable graph (strain against stress) explain following physical properties of a material. (9marks)

(a) Yield strength and yield point (1mark)

(b) Ultimate strength (1mark)

(c) Strain hardening (1mark)

(d) Necking (1mark)

(e) Failing point (fracture point) (1mark)

(f) Area of elastic behavior and plastic behavior (1mark)

(g) Proportional limit (1mark)

Q6.

(a) Briefly explain various methods of manufacturing process available in the industry. You may use sketches where necessary. (8 marks)

(b) Briefly explain the following heat treatment procedures.
Annealing, Hardening, Tempering and Normalizing (8 marks)

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1ST SEMESTER EXAMINATION QUESTION PAPER
APPLIED MECHANICS

- *This question paper consists of nine questions.*
- *Answer any SIX questions*

|		
Date: 2024.03.05	*Pass mark 50%*	*Time allocated: 03 Hrs*

1.

1.1 Define co-efficient of Friction and angle of friction and derive the relationship between the two. (4 Marks)

4.2 A body resting on a rough horizontal plane required a *pull* of 180 N inclined at 30^0 to the plane just to move it. It was found that a *push* of 220 N inclined at 30^0 to the plane required just moving the body. Determine the weight of the body and the co-efficient of Friction. (16 Marks)

2.

2.1 Using a suitable figure show that the resultant of two co-plainer, concurrent forces 'P' & 'Q' having 'θ' angle between them, can be written in the form of, $R = \sqrt{P^2 + Q^2 + 2PQ \cos \theta}$. Hence derive an expression for the resultant force if the angle between the forces is 90^0. (6 Marks)

2.2 Two forces act at an angle of 120^0 from each other as shown in below figure. The bigger force is 40N and resultant is perpendicular to the smaller one. Find the value of the smaller force. (7 Marks)
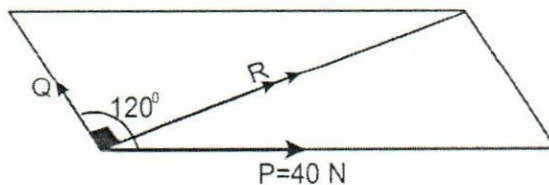
2.3 Find the magnitude of two forces, such that if they act at right angles, their resultant is $\sqrt{10}$N. But if they act at 60^0, their resultant is $\sqrt{13}$N (7 Marks)

3

3.1 state Newton's three laws of motion (3 Marks)

3.2 A train engine pulls a wagon up a slope with 5% upgrade. At some point along the slope, wagon gets detached from the train engine. At that moment the train was travelling with a velocity of 36km/h uphill. If the detached wagon has a mass of 50 tons and the track resistance is 100N per ton find the distance through which the wagon will travel before coming to complete rest. (12 Marks)
3.3 With the same track resistance and assuming no breaks, how long will it take the wagon to reach 18km/h in its downhill run? (5 marks)

4.

4.1 Draw a velocity versus time graph for the full motion of a ball thrown vertically in to the air under gravity (disregard the wind resistance). (6 Marks)

4.2 A loading lift goes down 750m deep inside a mining shaft in 45 seconds. For the first quarter of the distance, the velocity is being uniformly accelerated and during the last quarter the velocity is uniformly retarded, where the acceleration and retardation being equal. Using a velocity – time graph find the acceleration or retardation and uniform velocity of the lift, while traversing the central portion of the shaft.

(14 Marks)

5.

5.1 State and prove Archimedes Principle (2 Marks)

5.2 A Block of wood having a mass of 12 Kg floats on fluid. Find the volume of the block inside the fluid if the relative density of the fluid is 0.7. And also find the extra weight that should be placed on top of the object for it to immerse another100 cm^{-3} in the water.
(12 Marks)
5.3 calculate the extra weight that can be attached from the bottom of the block for it to immerse completely in the liquid. (Assume the extra weight mentioned in question 5.2 is removed for this calculation) (6 marks)

6.

6.1 Define "radian" and derive equations for angular displacement, angular velocity, and angular acceleration showing its relationships to its linear motion counterparts.
(6 Marks)
6.2 A flywheel is rotating at 200 rpm and after 10 seconds of uniform retardation it was observed that the value has reduced to 160 rpm. Using a velocity – time curve for the motion, determine the number of revolutions made by the flywheel during this period and the time it will take for the flywheel to come to rest from the initial speed of 200 rpm.
(14 Marks)

7.

7.1 Write Bernoulli theorem and identify variables with units of each. (4 marks)

7.2 Fresh water is flowing in a smooth pipe system having a uniform diameter of 120 cm. It is recorded that at elevation 'A' having pressure of 50 kPa and it is at a height of 20 m from the reference level. The section B having an elevation of 15 m recorded a pressure of 30 kPa. The water flow rate through a pipe is 12 m^3/s.

a. calculate the speed of water flow

b. Determine the direction of flow between section A and B.   (8 marks)

c. What is the total head loss?   (8 marks)

8.

8.1 What is center of pressure   (4 marks)

8.2 A rectangular plane surface 2m wide and 3m deep lies in water in such a way that its plane makes an angle of 30^0 with the free surface of water (see diagram below). Consider that its upper edge is 1.5 m below the free water surface. Determine;

a. The total pressure   (6 marks)

b. Position of center of Measured from water surface   (10 marks)

FREE WATER SURFACE
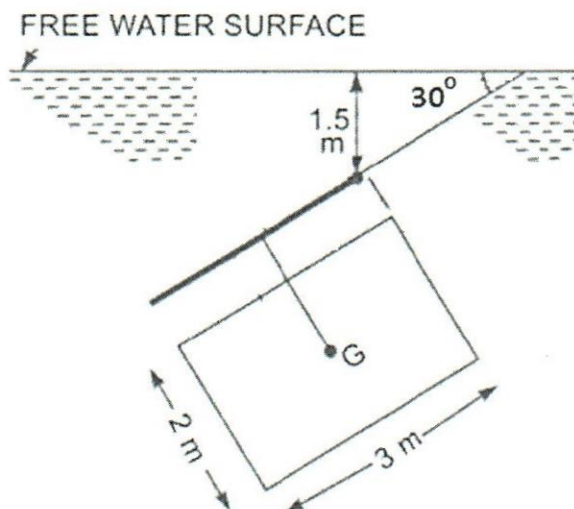
9.

9.1 A canoeist can paddle at 1 m/s in still water. He plans to cross a river of 20 m wide and the river is flowing at 1.5 m/s due east between straight parallel banks. The canoeist starts paddling upstream in a direction making an angle of 60^0 with the bank. Find.

a. His resultant velocity   (8 marks)

b. The time taken for the crossing to the nearest second   (12 marks)