



CINEC CAMPUS(PVT)LTD

Faculty of Marine Engineering

Department of Marine Engineering

EDUCATION &amp; TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I

COURSE CODE: ED 0350 PI (BATCH NO 46)

I<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER

## MARITIME LAW

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

Date: 30.06.2023

Pass mark 50%

Time allocated: 03 Hrs

- (01.) a) What is the IMO? Briefly explain. (04 Marks)
- b) Name the 04 committees of IMO. (04 Marks)
- c) What is TACIT approval and list the advantages of it. (08 Marks)
- (02.) With reference to UNCLOS, explain what is,
- a) An innocent passage? (04 Marks)
- b) Territorial sea? (04 Marks)
- c) Baseline? (04 Marks)
- d) Continental shelf? (04 Marks)
- (03.) With reference to MARPOL ANNEX I,
- a) What are the regulations when pumping out machinery spaces bilges outside special areas for ships more than 10,000 GT? (04 Marks)
- b) What certificate/ documents should be carried on board to comply with this annex? (08 Marks)
- c) Name the special areas which comes under MARPOL ANNEX I? (04 Marks)
- (04.) a) What are the 14 chapters contain in SOLAS? (08 Marks)
- b) What is non-combustible material? (04 Marks)
- c) What is the standard fire test? (04 Marks)

- (05.) As per ISPS code,
- a) What is a security level? Explain. (04 Marks)
  - b) Explain ship security plan. (04 Marks)
  - c) Explain the role of SSO and CSO. (04 Marks)
  - d) What is a ship security alert system? (04 Marks)
- (06.) With reference to ISM code,
- a) Explain why ISM is necessary? (04 Marks)
  - b) Who is a designated person? (04 Marks)
  - c) What are the certificates to be issued under ISM code? (02 Marks)
  - d) What is a critical equipment? (02 Marks)
  - e) What is non-conformity? (04 Marks)
- (07.) With reference to IMDG code,
- a) What is the objective of the code? (04 Marks)
  - b) What is the reason for the IMDG code to be updated every two years? (04 Marks)
  - c) What are the 09 classes of dangerous goods? (08 Marks)
- (08.) With regard to MLC 2006,
- a) Name 05 titles of the MLC 2006. (05 Marks)
  - b) Identify 05 areas that will be attended by the port state inspectors? (05 Marks)
  - c) Briefly explain the conditions for the minimum working and rest hours on board. (06 Marks)
- (09.) With reference to Annex VI,
- a) List the substances prohibited to be burnt in shipboard incinerators. (04 Marks)
  - b) State 02 Ozone depleting substances. (02 Marks)
  - c) Explain how ship engines exhaust gases cause air pollution. Also explain what are the preventive actions taken to control pollution by exhaust gases. (08 Marks)
  - d) Define emission control area. (02 Marks)



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1<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
 Thermodynamics

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

Date: 2023.06.29

Pass mark 50%

Time allocated: 03 Hrs

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

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. Describe the followings

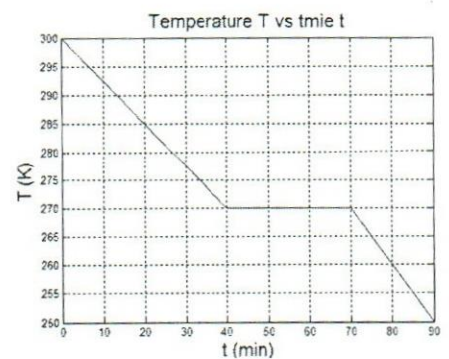
- Zero law in thermodynamics
- Specific heat capacity
- Specific latent heat of fusion

(6 marks)

b. A 0.400 kg sample is placed in a cooling apparatus that removes energy as heat at a constant rate. Figure gives the temperature  $T$  of the sample versus time  $t$ . The sample freezes during the energy removal. The specific heat of the sample in its liquid phase is 3 kJ/kg K. Estimate

- The rate of energy removal from the sample  
(4 marks)
- The latent heat of fusion of the sample  
(5 marks)
- The specific heat capacity in the frozen phase  
(5 marks)

(Hint: Use the data in the figure for the estimation)





- 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 °C** and **2 bar** is occupied in a volume of **0.02 m<sup>3</sup>**. The air sample is heated under constant pressure to **100 °C**. 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)
- 3.
- a. Describe the three type of expansion of solid materials. (4 marks)
  - b. Write expressions for coefficient of superficial expansion and coefficient of volumetric expansion using the coefficient of linear expansion of solid materials (4 marks)
  - c. An aluminum-alloy rod has a length of **10.000 cm** at **27 °C** and length of **10.015 cm** at **100 °C**. Assume that there is no bending or twisting of the rod during the expansion
    - i. What is the coefficient of linear expansion of the alloy? (4 marks)
    - ii. What is the length of the rod at the freezing point of water? (4 marks)
    - iii. What is the temperature if the length of the rod is **10.009 cm**? (4 marks)
- 4.
- a. Describe the three type of heat transfer mechanisms (4 marks)
  - b. State the Fourier law in heat transfer. (3 marks)
  - c. A pond of water has been in cold weather, and a slab of ice **5.0 cm** thick has formed on its surface. The air above the ice is **-10 °C**. Take the thermal conductivity of ice to be **0.5023 W/m K** and its density to be **0.92 g/cm<sup>3</sup>**.
    - i. What is the temperature of the ice and water interface? (3 marks)
    - ii. Estimate the rate of heat transfer from water to ice (4 marks)
    - iii. Calculate the rate of ice formation on the ice slab (6 marks)

5.

a. Describe the heat transfer, change in internal energy and work transfer for cyclic process (5 marks)

b. A closed system having a cycle of four processes, heat and work interactions are follows:

Process 1 – 2 : adiabatic compression  $Q_{12} = 0$ ,  $W_{12} = -600 \text{ kJ}$

Process 2 – 3 : constant volume heating  $Q_{23} = +2100 \text{ kJ}$ ,  $W_{23} = 0$

Process 3 – 4 : adiabatic expansion  $Q_{34} = 0$ ,  $W_{34} = + 2200 \text{ kJ}$

Process 4 – 1 : constant pressure heat rejection  $Q_{41}$ ,  $W_{41} = - 400 \text{ kJ}$

- Draw the *PV diagram* for the cyclic process (5 marks)
- Calculate the *rejection of heat* ( $Q_{41}$ ) (5 marks)
- Determine the *cycle efficiency* (5 marks)

6.

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

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

- Saturated water at  $250.3^\circ\text{C}$ , wet steam at  $40 \text{ bar}$  with  $0.95 \text{ dry}$ , dry steam at  $20 \text{ bar}$  and steam at  $20 \text{ bar}$  and  $300^\circ\text{C}$  (5 marks)

b. Steam enters to a super-heater at a pressure of  $20 \text{ bar}$  and dryness  $0.8$  and steam leaves the super-heater at  $300^\circ\text{C}$ . Using the steam tables, find

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

7.

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, $^\circ\text{C}$	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**

8.

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<sup>3</sup>/kg**. The gas leaves the turbine with a specific volume of **1.85 m<sup>3</sup>/kg**. The exit area of the turbine is **0.045 m<sup>2</sup>**. 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<sup>2</sup>** (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)

9. An internal combustion engine uses **6 kg** of fuel, having calorific value (i.e. heat generated by complete combustion of 1 kg of fuel under controlled condition) **48 MJ/kg**, in **one hour**. The temperature of **10 kg** of cooling water was found to rise through **10 °C per minute**. The temperature of **5 kg** per minute of exhaust gas with specific heat **1.3 kJ/kg K** was found to rise through **150 °C**. Calculate

- a. Thermal power generated by burning of fuel (5 marks)
- b. Power lost to the cooling water (5 marks)
- c. Power lost to the Exhaust gases (5 marks)
- d. Unaccounted power lost if The **Brake power** (useful power) developed is **22 kW** (5 marks)



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I<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
Workshop Theory (Batch 46)

• ~~This question paper consists of six questions.~~

• Answer All questions

Date: 2023.06.28

Pass mark 50%

Time allocated: 03 Hrs

1. Explain following manufacturing process. You may use sketches where necessary.
  - i. (a) Welding (3 marks)
  - (b) Forging (3 marks)
  - (c) Casting (4 marks)
  - ii. Give one example for each of above process. (3 marks)
  - iii. Explain cold rolling and hot rolling (7 marks)
  
2. (i) (a) With a suitable sketch show following points on a threaded bolt.  
Major diameter, Minor diameter, Crest, Root, Pitch diameter, Flank Angle, and Pitch (8 marks)
  
- (ii) Name the tool which used to measure the pitch of a threaded bolt (2 marks)
  
- (iii) Explain the procedure of making an internal thread of 8mm in a steel Plate using a Tap set. (8 Marks)
- (iv) What is meant by "14M" bolt) (2 Marks)
  
3. (I) Explain TIG and MIG welding procedure and their application. (08 marks)
  
- (II) Identify common welding faults that are found in arc-welding. (04 marks)
  
- (iii) What is the difference between destructive and non-destructive method of metal testing (2 marks)
  
- (iv) Name three type of crack detecting system. (6 marks)

4. a. Explain following heat treatment procedures. (8 marks)
- (i) Normalizing, Hardening, Annealing, Tempering
- b. Briefly explain the following properties of materials. (6 Marks)
- Hardness, Brittleness, Toughness, Ductility, Elasticity, Malleability
- c. Categories various type of steel according to the carbon percentage and uses (6marks)
5. With an aid of a suitable graph(strain against stress) explain following physical properties of a material. (13 marks)
- Yield strength and yield point. (1 mark)
- Ultimate strength. (1 mark)
- Strain hardening. (1 mark)
- Necking. (1 mark)
- Failing point (fracture point). (1 mark)
- Area of elastic behavior and plastic behavior. (1 mark)
- Proportional limit. (1 mark)





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EDUCATION & TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I  
COURSE CODE: ED 0350 PI (BATCH NO 45)



1<sup>ST</sup> SEMESTER EXAMINATION QUESTION PAPER  
APPLIED MECHANICS

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

Date: 2023.06.27

Pass mark 50%

Time allocated: 03 Hrs

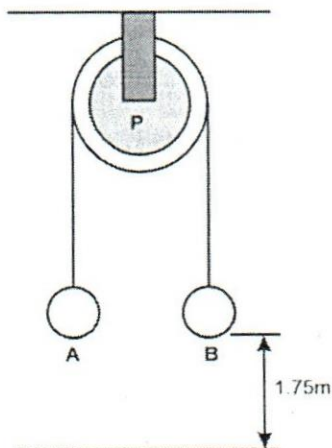
1.

1.1 Write three Newton's Laws

(3 marks)

1.2 Two particles A and B of respective masses 5 kg and 9 kg are each attached to the two ends of a light inextensible string which passes over a smooth pulley P. The two particles are both held at rest, 1.75 m above a horizontal floor with the portions of the strings as shown in the diagram. The system is then released from rest. When in motion, each particle is subject to a constant air resistance of 3.5 N. In the resulting motion B reaches the floor before A reaches P.

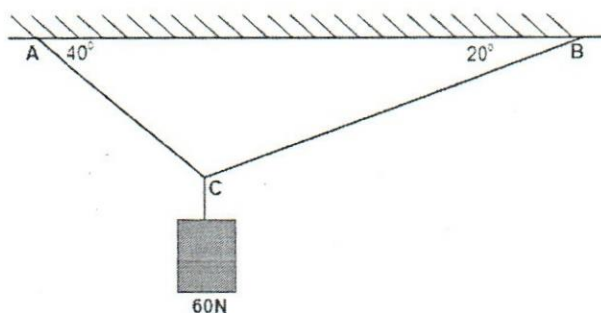
- Calculate the tension in the string, for the period before B reaches the floor. (10 marks)
- Determine the speed with which B strikes the floor. (7 marks)



2.

2.1 Write Lami's theorem with the help of a diagram (6 marks)

2.2 A box of weight 60 N is suspended by two strings AC and BC from a fixed horizontal ceiling. The box hangs in equilibrium. The strings are light and inextensible and are inclined at  $40^\circ$  and  $20^\circ$  to the ceiling, as shown in the figure below. Find the tension in each of the two strings. (14 marks)



3.

3.1 A car is travelling along a straight horizontal road and its motion is analyzed between two points  $A$  and  $B$  on the road. At time  $t = 0$  s, and at a point  $A$  on the road, the car is travelling with uniform speed 28 m/s. The car maintains this speed for 11 seconds. Car then decelerates uniformly for 10 s reaching a speed of  $u$  m/s. The car maintains this new speed of  $u$  m/s until it goes past a point  $B$  on this road. The distance  $AB$  is 700 m and the car took 37 s to travel from  $A$  to  $B$ .

- Sketch a speed time graph to show the motion of the car from  $A$  to  $B$ . (7 marks)
- Determine the value of  $u$ . (7 marks)
- Find the deceleration of the car during the motion described above. (6 marks)

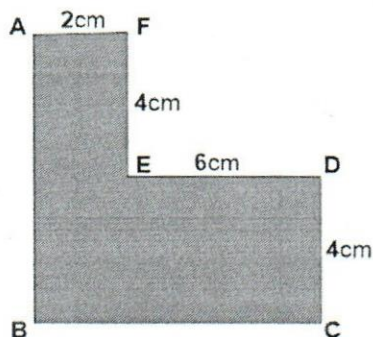
4.

4.1 The figure below shows a uniform lamina ABCDEF where all corners are right angles and  $AF = 2\text{cm}$ ,  $FE = 4\text{cm}$ ,  $ED = 6\text{cm}$  and  $DC = 4\text{cm}$ .

- Determine the position of the center of mass of the lamina. (Assume the  $X$  axis is along  $BC$  and  $Y$  axis is along the side  $AB$ ) (10 marks)

4.2 The lamina is suspended freely through a smooth pivot at  $B$  and hangs in equilibrium under its own weight.

- Find the size of the angle that  $AB$  makes with the vertical. (10 marks)



5.

5.1 Briefly describe centripetal and centrifugal force. (4 marks)

5.2 A parcel is placed on a rough flat horizontal surface at the back of a delivery van. The van travels around a circular bend of radius 25 meters at constant speed and the parcel does not slide. The coefficient of friction between the parcel and surface at the back of the van is 0.8. Calculate the greatest speed of the van can travel around this bend for the parcel doesn't slide. (8 marks)

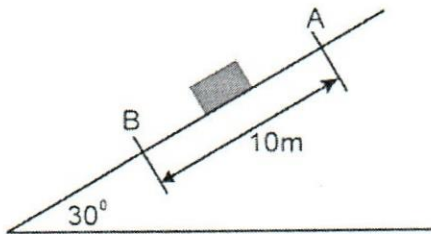
5.3 if another parcel starts to slide when the speed is 10m/s, calculate the friction coefficient between the second parcel and back of the van floor. (8 marks)

6.

6.1 describe briefly and derive fundamental equations for.

- Kinetic energy
- Potential energy (3X2 marks)

6.2 The below shows a particle sliding down a rough plane inclined at an angle of  $30^\circ$  to the horizontal. The box is released from rest at the point A and passes through the point B, which lies 10 m further down the plane, with a speed of  $V$  m/s. The points A and B lie on a line of greatest slope on the plane. The coefficient of friction between the particle and the plane is 0.25. Find the value of  $V$ , using only energy conservation concepts. (14 marks)



7.

7.1 A particle is projected from a point O on level horizontal ground with speed of 28 m/s at an angle  $\alpha$  to the horizontal, where  $\tan \alpha = 3/4$ . The particle is moving freely under gravity, reaching a greatest height above the ground before it lands on the ground at a point P.

- Find the time it takes the particle to reach the greatest height above the ground. (4 marks)
- Hence determine the distance range OP. (4 marks)

7.2 The particle reaches a height H meters above ground, 1 second after leaving O.

- Find the value of H. (6 marks)
- Hence calculate the length of time for which the height of the particle above the ground is greater than H. (6 marks)



8.

8.1 Derive Bernoulli equation from basic laws of mass-energy conservation (6 marks)

8.2 Fresh water flows down a sloping pipe which has one end (A) at an elevation of 6m while the other end (B) is at an elevation of 4.7 m measured from a datum line. . The pipe section tapers from 0.9m diameter at the top end A to 0.45m diameter at the lower end B. The mass flow of water is recorded to be 9 ton/min. Find the hydrostatic pressure difference ( $P_B - P_A$ ) between A and B in  $\text{kN/m}^2$ . (14 marks)

9.

9.1 What is center of pressure? (6 marks)

9.2 A rectangular side wall of a tank is 5m wide and 7m deep and is filled only up to a depth of  $D$  meters with sea water. It was found that the total force due to the water pressure on the tank side is 190kN. Taking the relative density of sea water as 1.1, find.

a. The value of  $D$ [m] (6 marks)

b. The distance from the top of the bulkhead to its center of pressure. (8 marks)



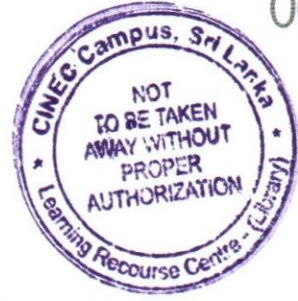
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EDUCATION &amp; TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I

COURSE CODE: ED 0350 PI



2<sup>ND</sup> EXAMINATION QUESTION PAPER  
Engineering Drawing

Date: 2023.06.09

Pass mark 50%

Time allocated: 03Hrs

Q: 1

Below figure shows the exploded view of a Plummer block bearing housing with Brasses. Assemble the different parts in their correct positions and draw to full size using **first angle projection** with the following views.

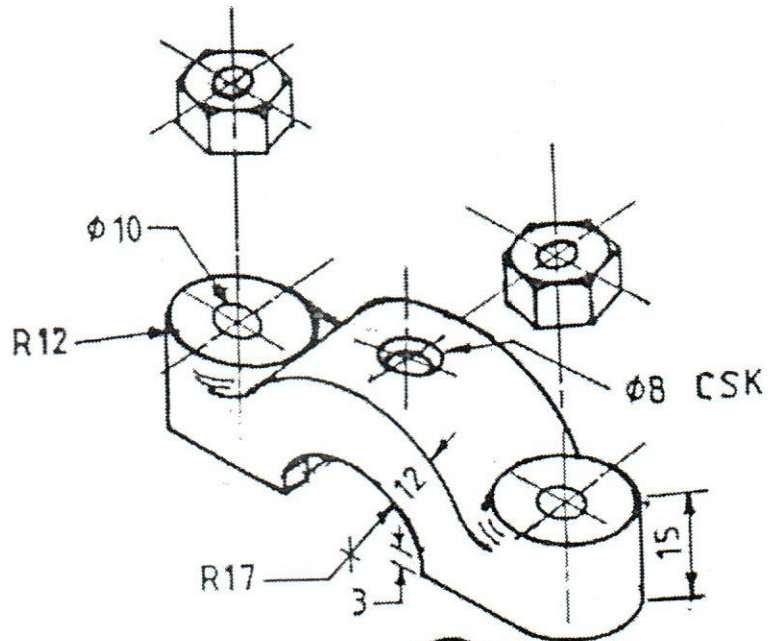
- i. Sectional front elevation looking in the direction of arrow X
- ii. End elevation projected to the left of front elevation view
- iii. Plan projected from front elevation view.

\*Assume any missing dimensions

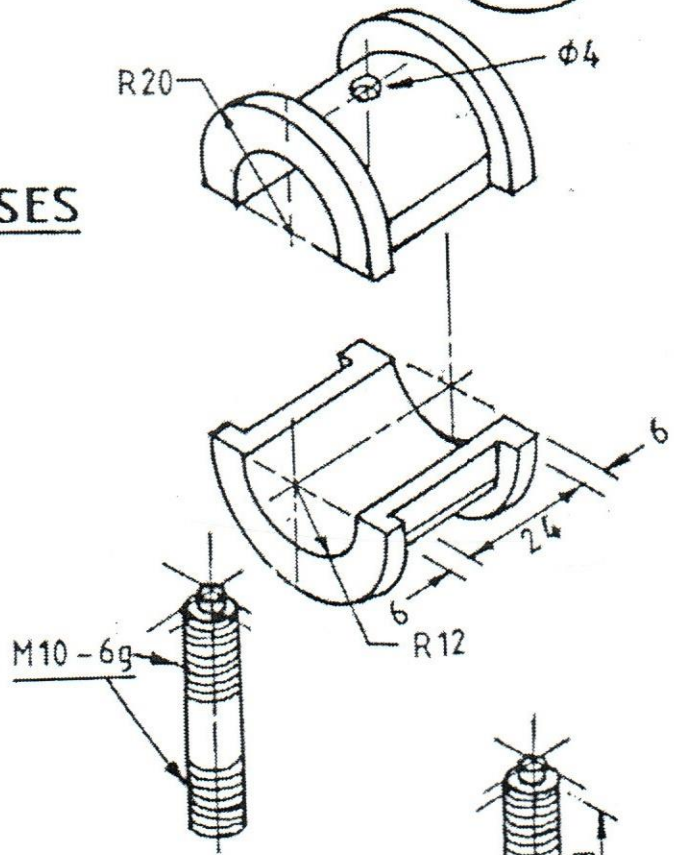
**Marking System**

Q: 1	View in Question (i)	:	40 Marks
	View in Question (ii)	:	20 Marks
	View in Question (iii)	:	20 Marks
	Dimensions (at least 6 dimensions distributed)	:	10 Marks
	Titles and letters	:	05 Marks
	Boundaries Lines and over all neatness	:	05 Marks

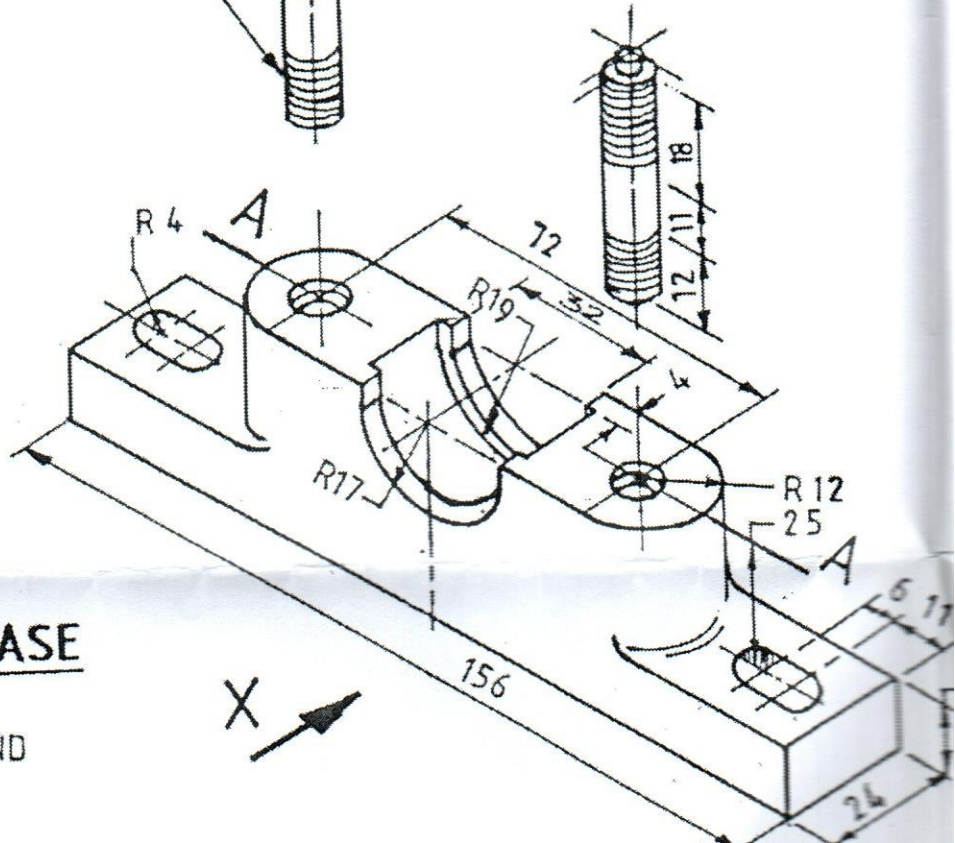
CAP



BRASSES

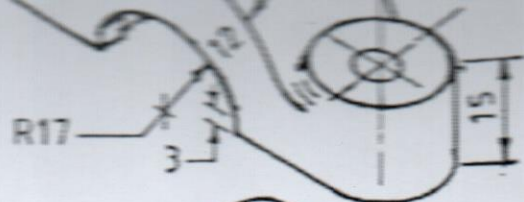


BASE

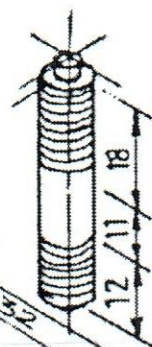
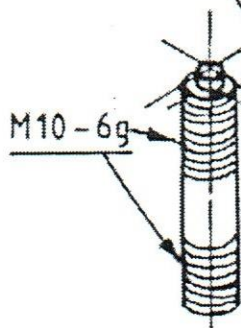
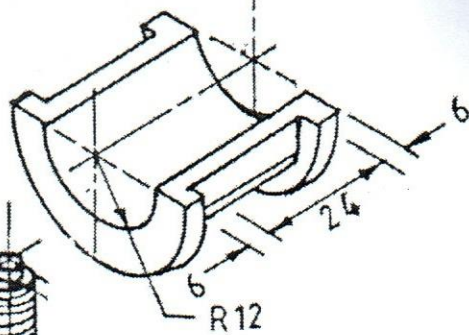
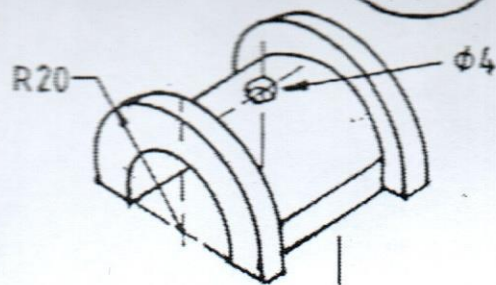




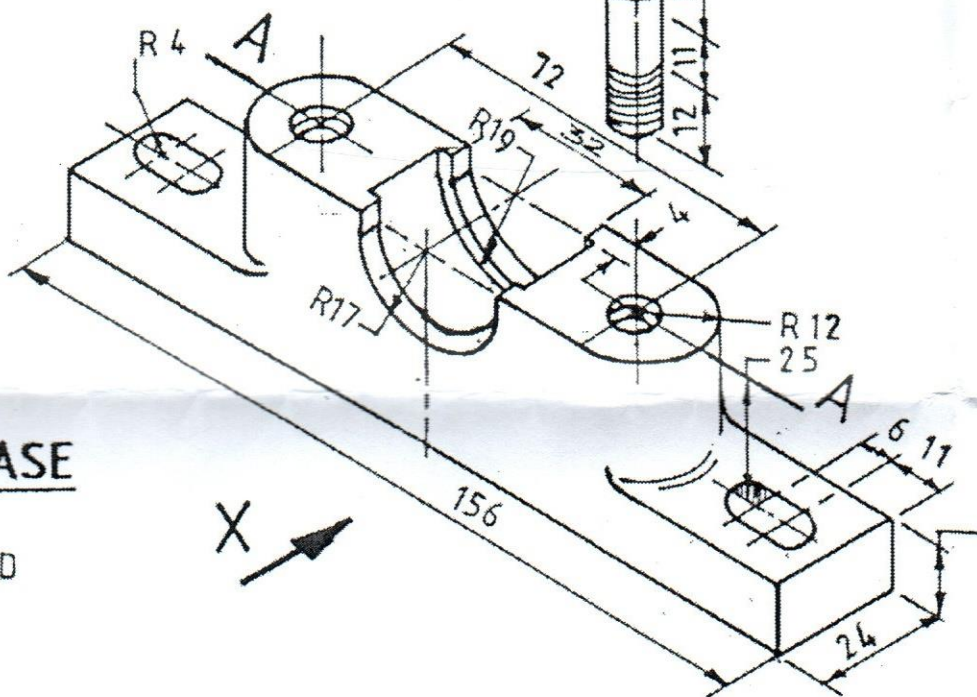
CAP



BRASSES



BASE



NUT END

METAL END

STUD



PLUMMER BLOCK

dimensions

Library Copy



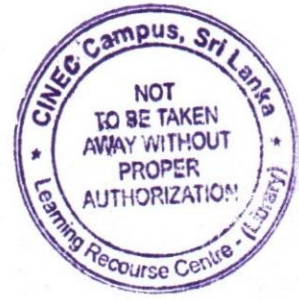
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COURSE CODE: ED 0350 PI



2<sup>ND</sup> SEMESTER EXAMINATION QUESTION PAPER  
Naval Architecture

- This question paper consists of eight questions.
- Answer Any Six (06) Questions

Date: 2023.06.06

Pass mark 50%

Time allocated: 03 Hrs

1. A ship 160m long and 8700 tonne displacement floats at a water line with half ordinates of 0, 2.4, 5.0, 7.3, 7.9, 8.0, 8.0, 7.7, 5.5, 2.8, and 0m respectively.
  - (i) Water plane area (9 Marks)
  - (ii) TPC (4 Marks)
  - (iii) Water plane area coefficient (3 Marks)
2. (i) Define the term " free surface effect" (4 marks)  
(ii) A ship of 10000 tonne displacement has KM 8m and GM 0.6m. Rectangular double bottom tank is 1.5m deep, 18m long 15m wide. Assuming the KM remains constant determine the new GM when the tank is now filled with sea water. (12 marks)
3. (i) Define the term "MCT1cm " (4 marks)  
(ii) A ship 150 m long has draught 7.70m forward and 8.25m aft, MCT1cm 250tm, TPC 26 and LCF 1.8m forward of mid-ships. Calculate the new end draught after the following masses have been added.  
50 tonne, 70m aft of mid-ships.  
170 tonne, 36m aft of mid-ships  
100 tonne, 5m aft of mid-ships  
130 tonne, 4m forward of midships  
40 tonne, 63m forward of midships.
4. A ship 125m long, 17.5m beam floats in sea water of  $1.025 \text{ t/m}^3$  at a draught of 8m. The water plane area coefficient is 0.83, block coefficient 0.759 and mid-ship section area coefficient 0.98. Calculate
  - (i) Prismatic coefficient (3 marks)
  - (ii) TPC (3 marks)
  - (iii) Change in mean draught if the vessel moves into river water of  $1.016 \text{ t/m}^3$ . (10 marks)



5. (a) Explain the meaning of freshwater allowance. (4 Marks)
- (a) A ship of 8000 tonne displacement floats in sea water of  $1.025 \text{ t/m}^3$  and has a TPC of 14. The vessel moves into fresh water of  $1.000 \text{ t/m}^3$  and Load 300 tonne of oil fuel. Calculate the change in mean draught. (12 Marks)
6. A ship displaces  $12240 \text{ m}^3$  Of sea water at a particular draught.
- (a) Calculate the displacement of the ship. (6 marks)
- (b) How many tonnes of cargo would have to be discharged for the vessel to Float at the same draught in fresh water. (10 marks)
7. State the purpose each of following and describe where they are located at the ship structure
- |                       |           |
|-----------------------|-----------|
| Duct keel             | (2 Marks) |
| Forward and aft sheer | (2 Marks) |
| Hawse pipe            | (3 Marks) |
| Spurling pipe         | (3 Marks) |
| Torsion box           | (3 Marks) |
| Freeing ports.        | (3 Marks) |
8. Briefly explain the purpose of following features included in ship structure. You may use suitable sketches where necessary.
- |  |           |
|--|-----------|
| Double bottom tank                     | (4 marks) |
| Bilge keel                             | (4 marks) |
| Longitudinal girders and shell plating | (4 marks) |
| Collision bulk head                    | (4 marks) |





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Faculty of Marine Engineering

Department of Marine Engineering

EDUCATION &amp; TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I

COURSE CODE: ED 0350 PI



02<sup>ND</sup> SEMESTER EXAMINATION QUESTION PAPER  
*Engineering Knowledge Motor*

Date: 2023.06.02

Pass mark 70%

Time allocated: 03Hrs

- Answer any *Six* questions

- 
- Briefly explain the purpose of a turbo charger fitted to a large marine diesel engine (04 Marks)
    - Sketch a turbo charger and name the parts (08 Marks)
    - State the purpose of the following.
      - The labyrinth glands (02 Marks)
      - Lacing wire on the blades (02 Marks)
  - Sketch and describe the operation of a two – stage air compressor. (10 marks)
    - What is Bumping Clearance? (03 marks)
    - Explain why intercoolers and after coolers are fitted. (03 marks)
  - Sketch a fuel injector of a diesel engine and name all the parts. (06 Marks)
    - Briefly explain the working principle (04 Marks)
    - Explain the method of adjusting the injection pressure. (02 Marks)
    - Explain factors influence for good combustion (04 Marks)
  - Briefly explain the following situations:

    - Scavenge fire (04 Marks)
    - Crankcase explosion (04 Marks)
    - Starting air pipeline explosion (04 Marks)
    - Exhaust gas uptake fire (04 Marks)

5. a) Briefly describe useful properties of lubrication oil used in diesel engines (10 Marks)  
b) What lubrication oil tests are being carried out on board. (04 Marks)  
c) Explain the importance of sending lubricating oil samples to a laboratory for analyses (02 Marks)
6. (a) Explain the two-stroke cycle of a marine diesel engine with the aid of valve timing diagram. (06 marks)  
(b) Explain the meaning of scavenging. (02marks)  
(c) Describe with an aid of sketches the three types of scavenging systems. (08 marks)
7. With reference to an electronically controlled large slow speed engine.
- a. State 4 benefits of electronically controlled fuel injection (04 marks)  
b. State the function of following controllers.  
i. MPC (02 marks)  
ii. CCU (02 marks)  
iii. EICU (02 marks)  
iv. ACU (02 marks)  
v. ECU (02 marks)  
c. Name two methods of lubrication used in electronically operated engines (02 marks)
8. a). Make a line diagram of the fuel oil system of a large vessel fitted with a slow speed diesel engine (08 Marks)  
b) State the function of,  
i. Settling Tank (02 Marks)  
ii. Quick closing valves (02 Marks)  
iii. Air vents (02 Marks)  
iv. Viscometer (02 Marks)
- 9.(a) Sketch an auxiliary boiler fitted in a motor vessel and mark all the important mountings. (08 Marks)  
(b) Describe the procedure of removal of floating sludge and the deposits at the bottom. (04 Marks)  
(c) Describe how to blowdown the gauge glass of an auxiliary boiler. (04 Marks)

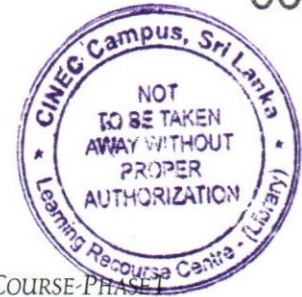


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Faculty of Marine Engineering  
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EDUCATION &amp; TRAINING COURSE: ENGINEER OFFICER CADET TRAINING COURSE-PHASE I

COURSE CODE: ED 0350 PI



2<sup>ND</sup> SEMESTER EXAMINATION QUESTION PAPER  
Engineering Knowledge General

- Answer any *Six* questions

Date: 2023.06.01

Pass mark 70%

Time allocated: 03 Hrs

1)

- Name the two types of heat exchangers found on ship and list their advantages and disadvantages. (06 Marks)
- Sketch and describe the arrangements of shell and tube type heat exchangers. (08 Marks)
- Referent to plate type heat exchangers state why plates are corrugated? (02 Marks)

2)

- Sketch a hydraulically controlled 4-ram steering system showing the main parts. (10 Marks)
- What is the function of the floating lever? (06 Marks)

3) Sketch and describe a biological sewage plant used on ship. (16 Marks)

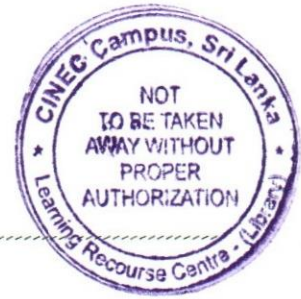
4)

- Briefly explain the work procedure during the following operations.
  - Before fuel oil bunker are taken,
  - During the bunkering is being carried out,
  - After completion of bunkering. (10 Marks)
- Obtain a sounding of a double bottomed tank by "Ullage" method of sounding. (04 Marks)
- Explain how to convert the sounding obtained (cm) to mass of fuels (MT) contained in the tank. (02 Marks)



- 5) With reference to plate type fresh water generator,
- a. Draw and explain the functions. (10 Marks)
  - b. Explain start and stop procedure. (06 Marks)
- 6) a. With aid of a stress and strain graph show the following.
- i.) UTS [Ultimate Tensile Strength]
  - ii.) Elastic Range
  - iii.) Yield point
  - iv.) Fracture point (10 Marks)
- b. On the simple diagram show tensile force, compressive force & shear force. (06 Marks)
- 7)
- a. Draw the line diagram of a refrigeration circuit and name its components. (06 Marks)
  - b. Write the purpose of each component. (08 Marks)
  - c. List the safety devices on the refrigeration system. (02 Marks)
- 8)
- a. State 04 types of pumps used on ships. (04 Marks)
  - b. State their purpose on board the ship. (04 Marks)
  - c. Describe the process of priming pump. (04 Marks)
  - d. Make a simple sketch of a centrifugal pump and show the following.
    - i.) Impeller
    - ii.) Shaft
    - iii.) Gland
    - iv.) Wearing (04 Marks)
- 9)
- i. Explain PID controller with the aid of sketches of block diagrams. Further briefly explain the function of each component. (04 Marks)
  - ii. Explain the fail-safe function of a system using examples. (04 Marks)
  - iii. Draw a sketch of a diaphragm valve and name components. (04 Marks)
  - iv. Explain the function of the thermocouple and mention its types. (04 Marks)

Faculty of Marine Engineering  
 Department of Marine Electrical Engineering  
 ENGINEER OFFICER CADET TRAINING COURSE-PHASE I  
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EXAMINATION QUESTION PAPER  
 Electrotechnology

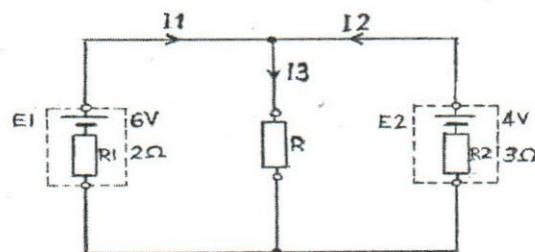
- This question paper consists 08 questions.
- Answer any five (05) Questions only.

Date: 2023.05.07

Pass marks 50%

Time allocated: 03Hrs

01. a. i. Draw the Oxygen atom and name all particles.  
 ii. What is an atomic number and atomic weight?  
 iii. What are called free electrons? (2 x 3= 06 Marks)
- b. What is an electric circuit ?. Draw and explain the essential parts of an electric circuit along with their functions. (06 Marks)
- c. Write short notes following electrical terms.  
 i. Electro motive force  
 ii. Resistivity  
 iii. Impedance  
 iv. Power factor (2 x 4= 08 Marks)
02. a. Four equal resistors are connected in parallel, and their resultant resistance is  $100\Omega$ . What would be their resultant resistance when connected in series. (06 Marks)
- b. Find the resistance of a 450m long tungsten wire of 0.05cm in diameter. The conductivity of tungsten is  $18.2\text{MS/m}$ . (08 Marks)
- c. A heater of 230V/4.35V is required to work for four (04) hours a day. Find the monthly cost of energy for 30 days at the rated of 50 rupees per unit. (06 Marks)
03. a. State Ohm's Law and Kirchoff's first and second laws for an electric circuit. (06 Marks)
- b. Find the current in each branch. (3 x 3=09 Marks)



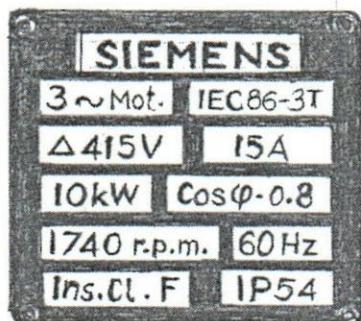
c. What is meant by "120Ah" of a lead-acid battery ?

04. a. Briefly explain the basic difference between the following electrical diagrams.

- i. Block                      ii. System (Power)  
iii. Circuit                    iv. Wiring

(1 x 4 = 04 Marks)

b. Figure shows a rating plate of an electric machine. Explain the following.



- i. Type of machine ?  
ii. Winding connection ?  
iii. Phase current in full load ?  
iv. Synchronous speed  
v. Number of magnetic poles  
vi. Slip.

(1 x 6 = 06 Marks)

c. Draw the circuit diagram of "POWER" and "CONTROL" circuit for D.O.L. Magnetic contactor motor starter circuit.

(Name the all terminal numbers and device identification letters)

Specification : Main supply : 3 ~ 440V ~ - 60Hz (Insulated neutral system)

Control circuit supply : 24V ~ - 60Hz

Motor : 440V ~ -5.5kW (1720 r.p.m.)

Indicating lamps : Motor running – "GRREN"

Motor overload – "RED"

Mains supply – "YELLOW"

(10 Marks)

05. a. What are thermo – cuples ?

(02 Marks)

b. How can three capacitors of capacitance  $3\mu\text{F}$ ,  $6\mu\text{F}$  and  $9\mu\text{F}$  respectively be arranged to a system of capacitance  $11\mu\text{F}$ . (Draw the connection arrangement).

(06 Marks)

c. A coil of resistance  $5.94\Omega$  and inductor  $0.35\text{H}$  is connected in series with a capacitance of  $35\mu\text{F}$  across a  $200\text{V} - 50\text{Hz}$  supply. Find

- i. the impedance (02 Marks)  
ii. the current flowing (02 Marks)  
iii. the angle of phase difference between voltage and current (02 Marks)  
iv. the voltage across the coil (02 Marks)  
v. the voltage across the capacitor (02 Marks)  
vi. the total active power taken from the supply. (02 Marks)



06. a. Explain the following.
- Fleming's left hand rule (02 Marks)
  - Faraday's laws of electro magnetic induction (02 Marks)
  - Remanence (02 Marks)
  - Magnetizing force. (02 Marks)
- b. an iron ring cross-sectional areas  $6\text{cm}^2$  is wound with a wire of 100 turns and has saw cut of 2mm. Calculate the magnetizing current required to produce a agnatic flux of 0.1mWb if mean length path is 30cm and relative permeability of iron is 470. . ( $\mu_0 = 4\pi \times 10^{-7} \text{ Vs/Am}$ ) (06 Marks)
- c. A conductor of length 0.5m situated in and at right angles to a uniform magnetic field of flux density 1 T moves with a velocity of 40m/s calculate the e.m.f. induced in the conductor. What will be the e.m.f. induced if the conductor moves at an angle  $60^\circ$  to the field. (06 Marks)
07. a. Draw the phase relation graph in a three- phase in a three phase voltage generating system. (05 Marks)
- b. Draw identical inductive loads of resistance  $15\Omega$  and reactance of  $40\Omega$  are connected in star to a 440V , three phase supply. Supply
- Phase current (02 Marks)
  - Line Current (02 Marks)
  - iii. Power absorber (02 Marks)
- c. When an electric cable in expressed as  
 $50\text{mm}^2 - 19/1.78\text{mm} , \text{Cu/XLPE/SWA/PVC/- } 600/1000\text{V}$   
 What does it signify ? (09 Marks)
08. a. Draw wiring diagram of single phase fluorescent lamp circuit .(Name all the accessories) (06 Marks)
- b. How do you check the winding condition and insulation on a three phase six (06) terminals induction motor. (08 Marks)
- c. Ten similar cells are connected in series to a load resistance of  $4\Omega$ . On connecting a high resistance volt meter across the battery, it shows 12V. But open circuit voltmeter indicates 18V. Find
- internal resistance of each cell. (03 Marks)
  - The current following through the external resistance. (03 Marks)