



MEO CLASS 2

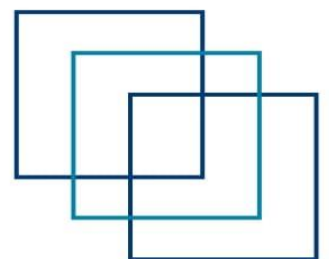
WRITTEN: EKG

(ENGINEERING KNOWLEDGE GENERAL)

FOR INDIAN COMPETENCY EXAM

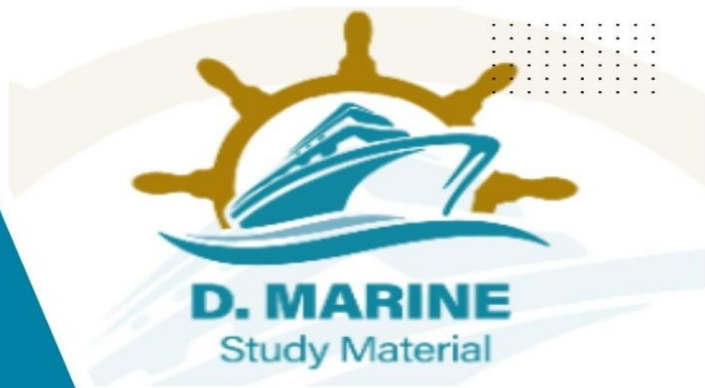


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JAN-2026

- 1.(a) Explain the Operational principle of a ship's stabiliser
(b) Describe with sketches Active and Passive types of stabilizers.

2026/JAN/01

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2. With regards to **boiler water level control**. Explain the following

- a) Shrink and swell phenomenon
- b) Cascade control
- c) Split control (16)
- d) Condensing Chamber-Function and location.

2024/JUN/02 2026/JAN/02

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3. With reference to **Keyless Propeller**:

- a) Sketch a section through a keyless sleeved propeller. (7)
- b) State the advantages of using a keyless sleeved propeller
- c) State with reason, Which metal sleeve should be made for contact with the forged mild steel tail shaft? (3)
- d) State the material uses to bond the sleeve to the propeller and the general thickness of the bonding material. (3)

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4. With reference to **shaft alignment**

- a) Explain the meaning of fair curve or rational alignment. (8)
 - b) Shaft alignment is often verified using hydraulic jacks to obtain a simple graph. Sketch such a graph, Indicating the following: Static load, (1)
- Hysteresis, Influence number: Explain the limitations of checking shaft alignment solely by hydraulic jacking methods. (8)

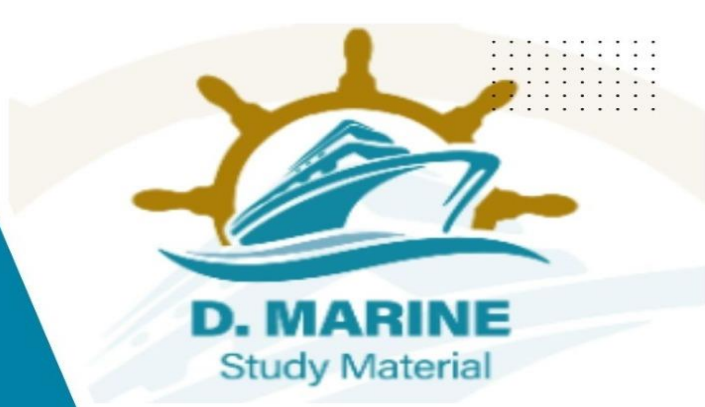
2022/DEC/08 2023/AUG/05 2024/JUN/04 2024/DEC/07

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5. With respect to **Energy efficient running of ships.**

a) Sketch and explain the optimization of propeller hull interface flow devices and Improvement of propulsion efficiency

b) sketch and explain the optimization of Auxiliary machinery using VFDS. (8)

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6.a) Examine in detail three common but entirely different reasons for loss of steering gear systems (5)

b) State how failure is inhibited in the design, operation and maintenance of steering gear systems (5)

c) Describe how a vessel may make port upon irreparable failure of the steering telemotor (6)

2024/JUN/06

2025/FEB/08

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7a) Draw a block diagram for a fully automated accommodation air conditioning unit, labelling the component parts and indicating the directions of air flow (9)

b) Explain why the unit includes means of dehumidification and humidification

c) A chart is used for ensuring that the accommodation conditions are within the so-called Comfort Zone: what useful information does the chart give?

2022/DEC/04

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8. Sketch and describe a **stockless anchor** illustrating the method or device used to attach it to the chain cable. When the anchor and cable are ranged during the ship's underwater survey what parts require special attention and what defects are likely to be discovered (16)

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9. Explain how the ingress of sea water is prevented in an **oil lubricated stern bearing system**. Should the system fail, describe the corrective action possible whilst the vessel is afloat. State why two stern bearing oil header tanks are fitted in some Instances? (16)

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FEB-2026

(a) Sketch and explain a fully automated air conditioning system for accommodation spaces, annotating the relevant temperatures and relative humidity's throughout the system. (12)

(b) Describe how bacteria are prevented from multiplying to a harmful level in an air conditioning system. (4)

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2) Sketch and describe a high-pressure cut-out in a refrigeration system. (6)

b) The refrigeration compressor has stopped due to operation of the h. p. cut-out. Explain -

(i) The possible causes. (6)

(ii) How these causes would be found and possible remedies

c) What steps are taken if the compressor "short-cycle" on low pressure cut-out? (4)

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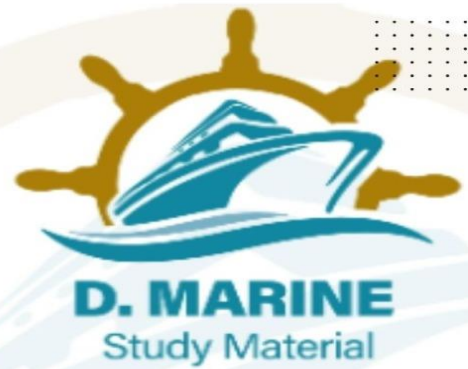
2026/FEB/02

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3)a. Briefly discuss the principle and the key components and elements of an ICCP system, outlining their functions in safeguarding the integrity of metal structures on ships. (10)



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b) Enumerate the advancements in ICCP technology over the years and how these innovations contribute to more efficient and sustainable corrosion protection. (6)

2024/FEB/03 2026/FEB/03

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4.a) What different methods are used for preserving ship's hull during service. What type of Antifouling coats are used? (6)

b) State what materials are being banned by international regulation for use in Antifouling coats and the reason for banning. (5)

c) Discuss briefly how does paint coating on deck differ from that on super structure. (5)

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5. An engine room is operating in the unmanned (UMS) mode. In the event of a failure of the UMS systems explain the arrangements a second engineer officer should introduce to operate the machinery in manual mode for a passage of 10 days duration.

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6. Define creep and specify the conditions under which it occurs? (6)

b) Discuss three metallurgical/processing techniques that are employed to enhance the creep resistance of metal alloys. (10)

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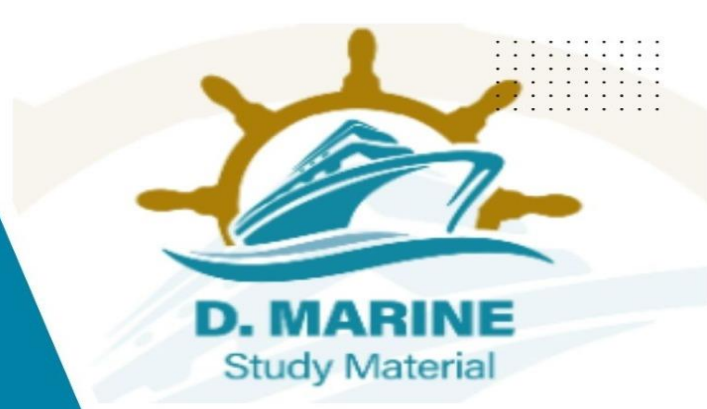
7. Explain EACH of the following metallurgical processes:

(a) Induction hardening

(b) Nitriding



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(c) Case hardening (4)

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8 With reference to Boiler feed regulation:

a) Describe, with the aid of sketches, the operation of a boiler feed water regulator controlled by at least two other parameters besides water level in the drum. (6)

b) Give reasons for the inclusion of the other elements besides water level in controlling feed flow. (5)

c) Deduce the possible effects on the system when the drain valve in the constant leg in the level transmitter starts to leak.(4)

2022/OCT/05 **2024/FEB/08** **2026/FEB/08**

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9a) Sketch and describe a Pilgrim Nut for securing a propeller to the screw shaft.

b) Describe how this device is used to loosen the propeller on the shaft when removal or inspection becomes necessary. (5)

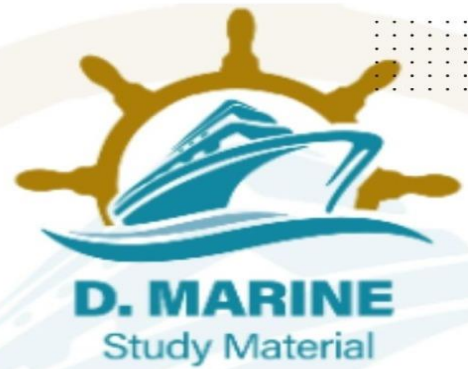
c) Give four reasons why this method is considered to be superior to all other methods.

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MAR-2026

Q1. With reference to the Fuel standards ISO-8217-2017 discuss the amendments made as compared to its previous edition. Explain the significance of the following: (16)

- (a) Pour point, cloud point and cold filter plugging point.
- (b) Cat fines
- (c) Fatty Acid Methyl Ester
- (d) Dissolved H₂S in fuel.

2021/SEP/Q6 2022/FEB/Q6 2022/APR/Q2 2025/APR/Q1
2026/MAR/Q1

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Q2. With reference to Air conditioning systems onboard for accommodation spaces:

- a) Sketch and explain a fully automated air conditioning system, annotating the relevant temperatures and relative humidity's throughout the system. (12)

- b) Explain how bacteria are prevented from growing in an air conditioning system to a dangerous degree. (4)

2026/FEB/Q1 2026/MAR/Q2

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Q3. a) Describe the key phases and microstructures present in the iron-carbon equilibrium diagram and explain their significance in the heat treatment of steel. (8)

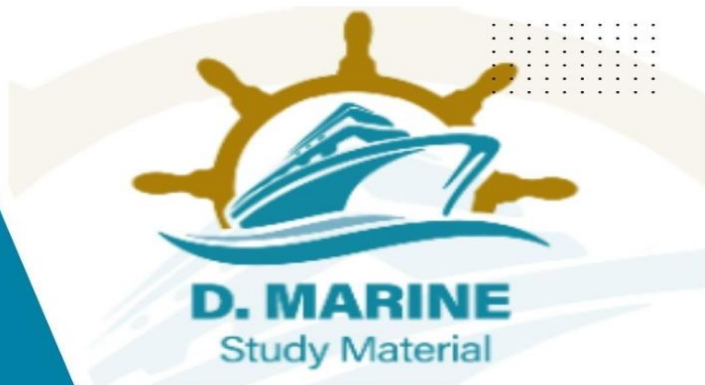
- b) How do the different regions of the iron-carbon diagram influence the mechanical properties of steel, such as hardness, toughness, and ductility? Provide examples of how specific compositions and heat treatments can achieve desired properties. (8)

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Q4. a) As per SOLAS regulations, what checks and tests must be carried out on the steering gear system before the ship's departure from port? Explain the procedures involved and the documentation required. (8)

b) Explain the construction, working and purpose of hunting gear in a steering gear system. What are the consequence of its failure? (8)

2025/APR/Q4 **2026/MAR/Q4**

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Q5. With reference to fuel oil viscosity: (16)

(a) Explain why correct fuel oil viscosity is necessary

(b) Describe TWO methods for the measurements of viscosity that are suitable for the inclusion into a pneumatic or electronic control system.

(c) State, with reasons, a control action for a viscosity controller.

2021/SEP/Q4 **2021/DEC/Q4** **2022/APR/Q7** **2025/APR/Q5**

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Q6. Compare and contrast open-loop, closed-loop, and hybrid EGCS. What are the advantages and disadvantages of each system, and in what scenarios is each type preferred? (16)

2026/MAR/Q6

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Q7. With reference to a keyless propeller designed for hydraulic (wet) fit and withdrawal:

(a) Describe, with the aid of a sketch, how the propeller is fitted to the tail shaft. (10)

(b) State TWO advantages compared to a dry fit: (3)

(c) Explain how the thrust is transmitted without the use of a key and keyway.

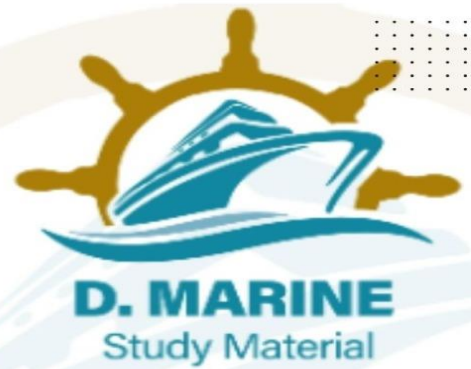
2026/MAR/Q7

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Q8. (a) Describe, with the aid of a Strain versus Time diagram, how a creep test is carried out to determine the strain rate of the material under test. (6)



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(b) Explain EACH of the stages sketched in the diagram in part. (4)

2026/MAR/Q8

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Q9. (a) Explain the action of EACH of the following metallurgical mechanism:

(i) Creep

(ii) Brinelling

(iii) Fretting

(iv) Fretting corrosion. (10)

(b) State, with reasons, where EACH of the mechanisms in occur in ship propulsion system. (6)

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2021/APR/Q7

2021/AUG/Q8

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APRIL - 2026

Q1. With reference to Ship Stabilizers usually used in passenger ships:

(a) Explain the operation principle of ship's stabilizer. (8)

(b) Describe with sketches Active and Passive types of stabilizers. (8)

2025/NOV/Q8

2026/JAN/Q1

2026/APR/Q1

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Q2. With regards to boiler water level control. Explain the following

A. Shrink and swell phenomenon.

B. Cascade control.

C. Split control.

D. Condensing chamber – Function and location.

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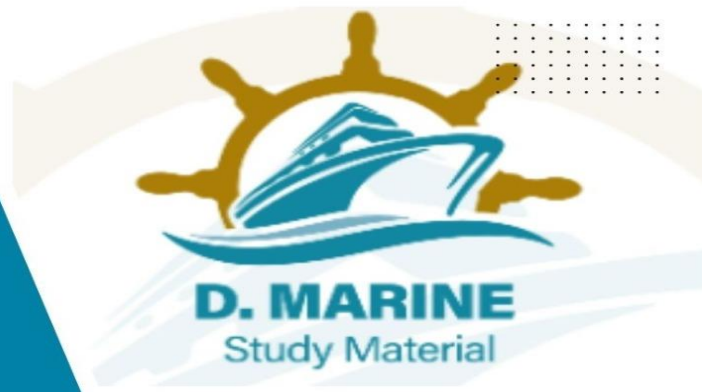
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Q3.a) Describe the key phases and microstructures in the iron-carbon equilibrium diagram and explain their significance in the heat treatment of steel. (8)

(b) How do the different regions of the iron-carbon diagram influence the



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mechanical properties of steel, such as hardness, toughness, and ductility? Provide examples of how specific compositions and heat treatments can achieve desired properties. (8)

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Q4. With reference to shaft alignment:

(a) Explain the meaning of fair curve or rational alignment (6)
(b) Shaft alignment is often verified using hydraulic jacks to obtain a simple graph. Sketch such a graph, indicating the following:

(i) Static load

(ii) Hysteresis

(iii) Influence number (6)

(c) Explain the limitations of checking shaft alignment solely by hydraulic jacking methods. (4)

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Q5. With respect to Energy efficient running of ships.

(a) Sketch and explain the optimization of propeller hull interface flow devices and improvement of propulsion efficiency. (8)

(b) Sketch and explain the optimization of Auxiliary machinery using VFDs.

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Q6.a) Examine in detail three common but entirely different reasons for loss of steering gear systems. (5)

(b) State how failure is inhibited in the design, operation and maintenance of steering gear systems. (5)

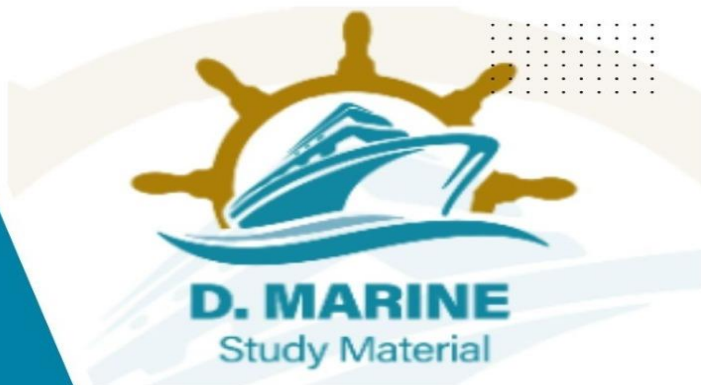
(c) Describe how a vessel may make port upon irreparable failure of the steering telemotor. (6)

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Q7. A. Draw a block diagram for a fully automated accommodation air conditioning unit, labelling the component parts and indicating the directions of air flow. (8)

B. Explain why the unit includes means of dehumidification and humidification. (4)

C. A chart is used for ensuring that the accommodation conditions are within the so-called Comfort Zone: what useful information does the chart give? (4)

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Q8. With reference to plate heat exchangers, explain how EACH of the following design aspects promote heat transfer.

(a) Material selection. (6)

(b) Flow pattern. (6)

(c) Extended surface area. (4)

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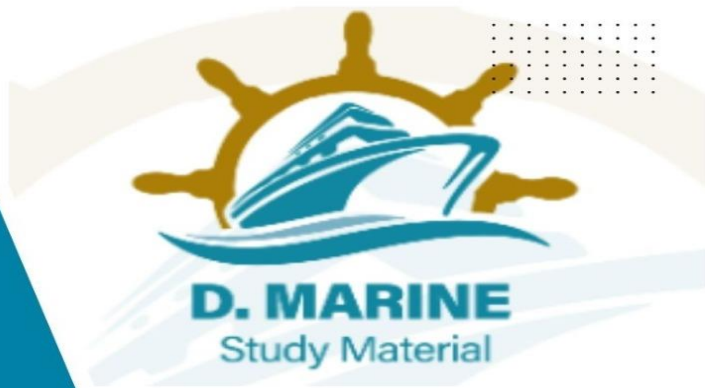
Q9. Explain how the ingress of sea water is prevented in an oil lubricated stern bearing system. Should the system fail, describe the corrective action possible whilst the vessel is afloat. State why two stern bearing oil header tanks are fitted in some instances? (16)

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JUNE-2026

1. Crankcase Oil Mist Detectors (OMD) have undergone significant changes in recent years. Compare the modern multiple sensor type with the traditional single sensor type OMDs, where sampling was done sequentially. What is meant by addressable sensors?

2026/JUN/01

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2. (a) Define creep and specify the conditions under which it occurs?
(b) Discuss three metallurgical processing techniques that are employed to enhance the creep resistance of metal alloys.

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3. (a) Describe, with the aid of a sketch, an open-loop system for reducing SO_x emissions from engine exhaust gas, explaining how the system operates whilst the vessel is in open waters.

(b) Describe, with the aid of a sketch, a closed-loop scrubber system for removing SO_x from engine exhaust gas, explaining the operation of this unit and stating when it would be used.

2025/JAN/08

2025/JUN/03

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4. With reference to tubular heat exchangers, state the various types of such heat exchangers used onboard a ship. Explain with sketches how the construction, flow pattern, and baffle, differ from each other depending upon the medium in use.

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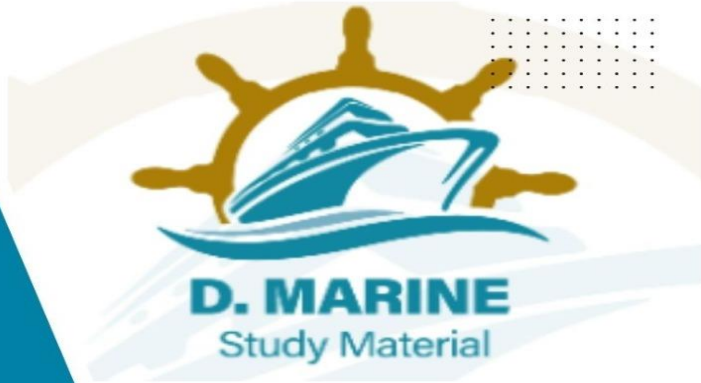
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5. With reference to refrigeration systems used onboard ships:

- (a) How do we choose environment-friendly refrigerants for ships?
- (b) How do CFCs, HCFCs, HFCs, and natural refrigerants like ammonia and carbon dioxide compare in terms of ozone depletion potential (ODP) and global warming potential (GWP)?
- (c) What are the benefits and challenges of using natural or low-GWP refrigerants on marine vessels?
- (d) explain step you will take to ensure that release of refrigerant gases from the plant is minimized during normal operation and during maintenance activities.

2025/JUN/05 **2025/DEC/04** **2026/JUN/05**

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- 6.(a) Describe, with the aid of a sketch, the main engine ancillary equipment for automatic monitoring and regulation of fuel viscosity.
- (b) Explain the operation of the equipment described in 6(a).
- (c) Discuss the single-fuel concept.

2025/JUN/06 **2025/NOV/06** **2025/DEC/06** **2026/JUN/06**

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7. (a) Explain the concept of a fail-safe and fail-set system on a ship, providing examples of each system.
- (b) Describe the advantages and disadvantages of both systems.
- (c) How does the design difference impact overall reliability and safety of the vessel?

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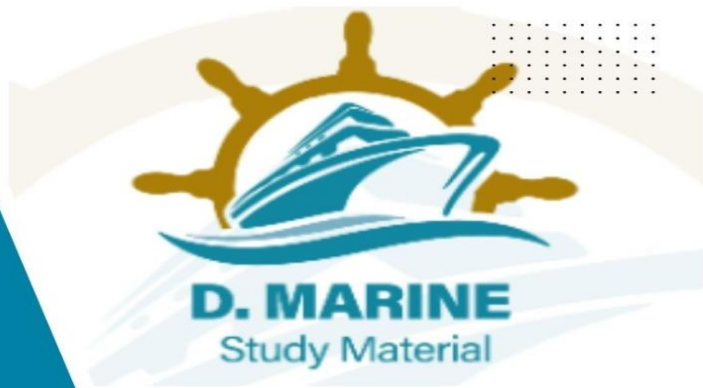
8. (a) Sketch a line diagram showing the layout components of a hydraulic system with a variable delivery, pressure-compensated pump and accumulator, suitable for the operation of deck machinery.
- (b) Describe the operation of the system sketched in part 8(a).

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9. What are the differences between destructive and non-destructive testing methods for materials? Discuss the advantages and disadvantages of each approach, and provide examples of specific tests used in both categories to ensure the integrity and quality of materials used in shipbuilding.

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