

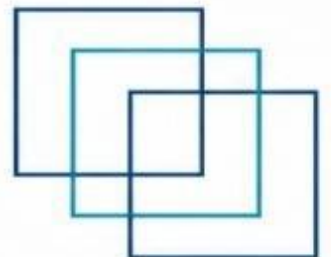


MEO CLASS 4 WRITTEN: NA (NAVAL ARCHITECTURE)

FOR INDIAN COMPETENCY EXAM

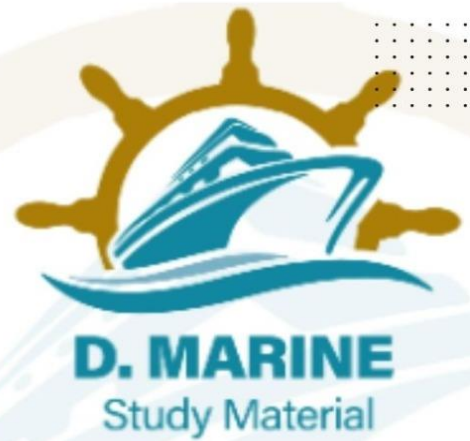


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JANUARY - 2026

1. Explain the following:

- (a) Sub division; (4)
- (b) Margin line (4)
- (c) Floodable length; (4)
- (d) Watertight bulkhead penetration (4)

2026/JAN/Q1

[Click Here to See the Answer](#)

Q2. (a) Define any six types of ship motions. (6)

(b) In the context of ship stability, what does static stability refer to: (10)

- (i) The ship's resistance to rolling in waves.
- (ii) The ship's ability to return to equilibrium after a displacement without wave action.
- (iii) The dynamic response of a ship in irregular seas.
- (iv) The resistance to hull slamming.

Briefly justify your answer.

2026/JAN/Q2

[Click Here to See the Answer](#)

Q3. (a) Explain why a Spectacle Frame and Boss Plates are fitted to twin screw ships. (8)

(b) Make a simple sketch of a Spectacle Frame showing how it is attached to the ship structure and to the Boss Plates. (8)

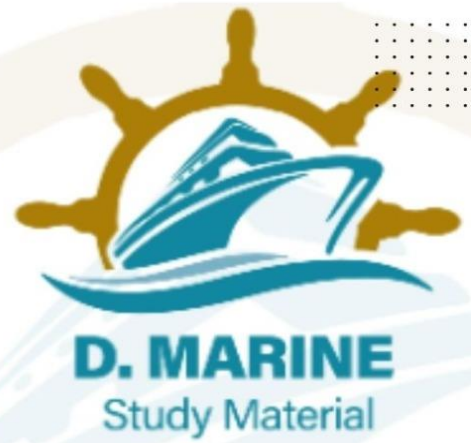
2026/JAN/Q3

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Q4. (a) Sketch the arrangement of rudder stock, bearings, glands and method of suspension of a pintleless rudder, labelling the components parts. (8)



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(b) State how the bearing wear down is measured and what prevents the rudder from jumping? (8)

2022/AUG/Q4 **2023/AUG/Q2** **2024/JUN/Q4** **2025/APR1/Q4**
2025/JUN/Q4 **2026/JAN/Q4**

[Click Here to See the Answer](#)

Q5. Describe the construction of chain lockers and how cables are secured in the lockers? Explain how to secure anchors in preparation for a sea passage. (16)

2023/AUG/Q3 **2024/JUN/Q5** **2025/APR1/Q5** **2025/JUN/Q5**
2026/JAN/Q5

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Q6. (a) Explain in brief the term 'bulwark' and 'freeing port'. (6)

(b) A ship has 300 t of cargo in the hold, 24 m forward of the midships. The displacement of the vessel is 6000 t and its centre of gravity is 1.2 m forward of midships. Find the new position of the centre of gravity if this cargo is moved to an after hold, 40 m from midships.

2026/JAN/Q6

[Click Here to See the Answer](#)

Q7. (a) What is Freeboard of a Ship? Why oil tankers have less freeboard?

(b) A ship's length at the waterline is 180 meters, with a maximum beam of 30 meters and a draft of 9 meters. If the ship's volume of displacement is 38,880 cubic meters, calculate its block coefficient. (10)

2025/JUN/Q7 **2026/JAN/Q7**

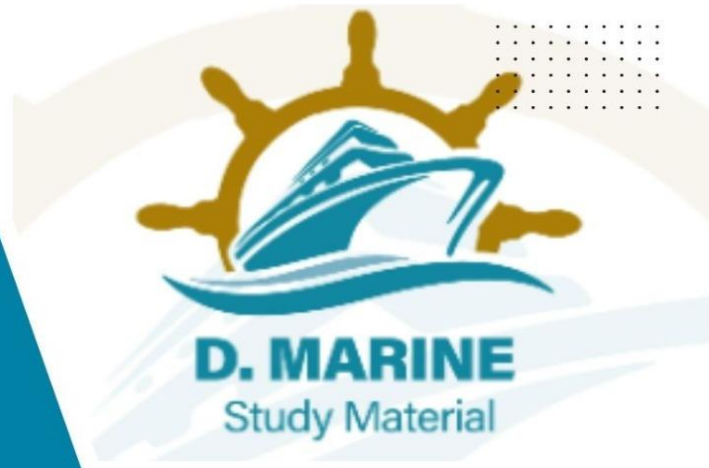
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Q8. The half-ordinates of a ship's water-plane, which is 80 m long, commencing from forward at equal intervals, are as follows: 0.2, 4.0, 5.0, 5.2, 5.0, 4.0 and 0.2 m respectively. Calculate the area of the water-plane using Simpson's First Rule.

2025/JUN/Q8 **2026/JAN/Q8**



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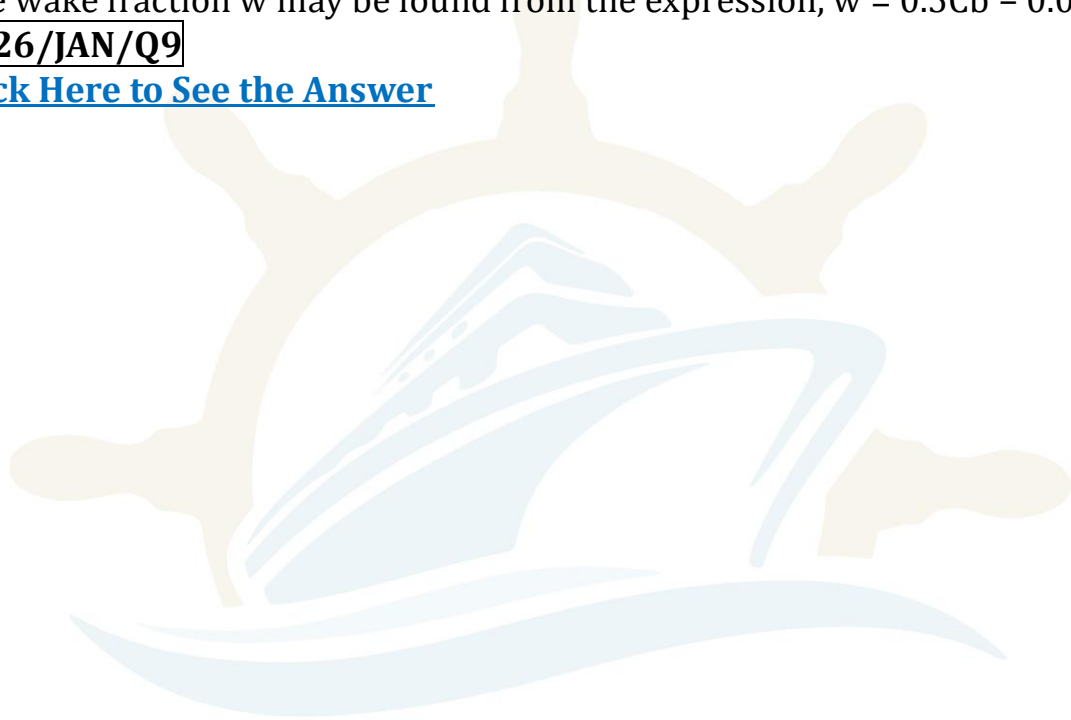
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Q9. (a) What is the purpose of conducting inclining experiment on a new vessel? (6)

(b) A ship of 12400 tonne displacement is 120 m long, 17.5 m beam and floats at a draught of 7.5 m. The propeller has a pitch ratio of 0.75 and, when turning at 100 rev/min, produces a ship speed of 12 knots with a real slip of 30%. Calculate the apparent slip, pitch and diameter of the propeller. The wake fraction w may be found from the expression, $w = 0.5Cb - 0.05$

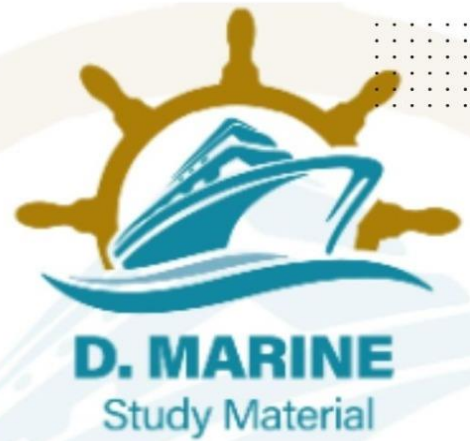
2026/JAN/Q9

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FEBRUARY - 2026

Q1. For a ship the center of buoyancy and the metacenter are in the line of action of the buoyant force.

- (a) Only when there is positive stability
- (b) Only when there is negative stability
- (c) Only when there is neutral stability
- (d) At all times Justify your answer. (16)

2024/APR1/Q1 **2024/DEC2/Q1** **2025/AUG/Q1** **2026/FEB/Q1**

[Click Here to See the Answer](#)

Q2. Explain the meaning and purpose of EACH of the following terms: [4*4]

- (a) Duct keel
- (b) Margin line
- (c) Sheer
- (d) Round of Bilge

2024/APR1/Q2 **2024/DEC2/Q2** **2025/AUG/Q2** **2026/FEB/Q2**

[Click Here to See the Answer](#)

Q3. With reference to hull protection against corrosion describe how EACH of the following operate:

- (a) Sacrificial anodes (8)
- (b) Impressed current system (8)

2023/OCT/Q4 **2024/APR1/Q3** **2024/DEC2/Q3** **2025/AUG/Q3**

2026/FEB/Q3

[Click Here to See the Answer](#)

Q4. With reference to bilge keels:

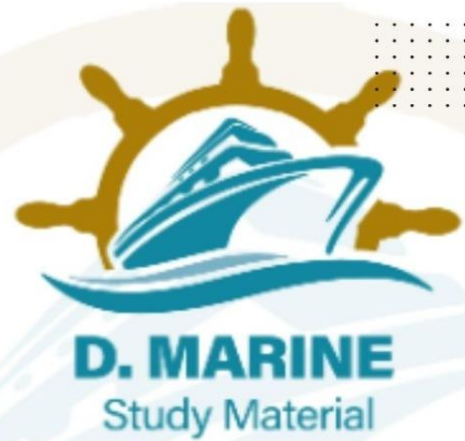
- (a) Describe how the design and method of attachment reduce the possibility of damage to the shell plate. (8)
- (b) State what testing must be carried out. (4)
- (c) Explain why the bilge keels do not extend the full length of the vessel.

2024/DEC2/Q4 **2025/AUG/Q4** **2026/FEB/Q4**

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Q5. With reference to large bulk carriers:

- (a) Sketch a cross section of a bulk carrier through the mid-ship. (8)
- (b) Explain the design features that have evolved to minimise the possibility of failure. (8)

2024/DEC2/Q5 **2025/AUG/Q5** **2026/FEB/Q5**

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Q6. (a) Define angle of loll (6)

- (b) A box barge 60m long and 10m wide floats at an even keel draught of 4m. It has a compartment amidships 12m long. Calculate the new draught if this compartment is laid open to the sea when: (10)

- (i) μ is 100%
- (ii) μ is 85%
- (iii) μ is 60%

2024/APR1/Q6 **2024/DEC2/Q6** **2025/AUG/Q6** **2026/FEB/Q6**

[Click Here to See the Answer](#)

Q7. (a) What do you understand by 'coffin plate'?

- (b) A ship displacing 10000 tonne and travelling at 16 knots has a fuel consumption of 41 tonne per day. Calculate the consumption per day if the displacement is increased to 13750 tonne and the speed is increased to 17 knots. Within this speed range, fuel consumption per day varies as (speed)^{3/8} (10)

2024/APR1/Q7 **2024/DEC2/Q7** **2025/AUG/Q7** **2026/FEB/Q7**

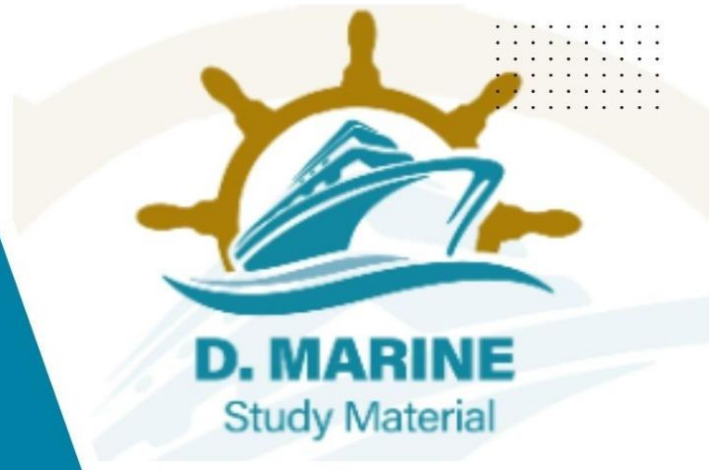
[Click Here to See the Answer](#)

Q8. A ship with a displacement of 8,200 tonnes and a length of 90m is floating in sea water with a density of 1.024 t/m³. The half-ordinates of the waterplane area at equal intervals are 0.261, 3.68, 1.74, 5.81, 7.00, 7.30, 6.47, 5.35, 4.26, 3.16, 1.88. and 0 m. Calculate: (16)

- (i) Calculate the waterplane area using Simpson's First rule.
- (ii) Calculate the TPC (Tonnes Per Centimetre Immersion) in sea water.



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(iii) Find the change in mean draught when the ship moves from sea water of density 1.02 t/m^3 into river water with a density of 1.005 t/m^3

2026/FEB/Q8

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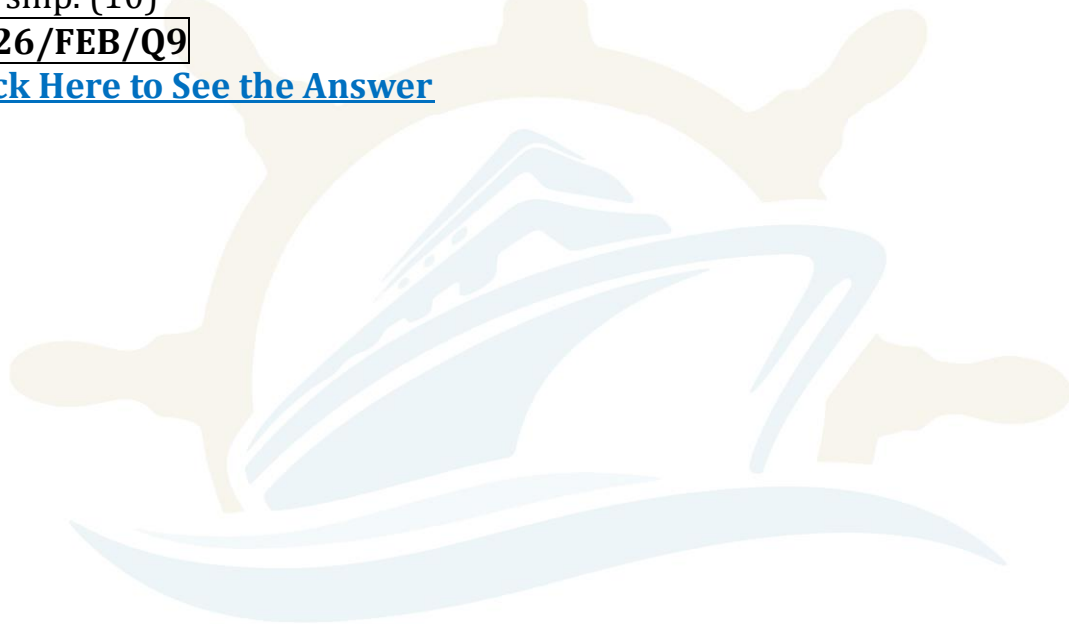
Q9. (a) What are the water pressure loads on the ship's hull. (6)

(b) A ship of 5,000 tonnes displacement has a KM of 6.2 m and a KG of 5.5 m. It has a rectangular double-bottom tank of length 16m and breath 10 m, which is partially filled with diesel oil (Relative Density = 0.88). Calculate

(a) The free surface correction (FSC) or virtual rise in KG. b) The final GM of the ship. (10)

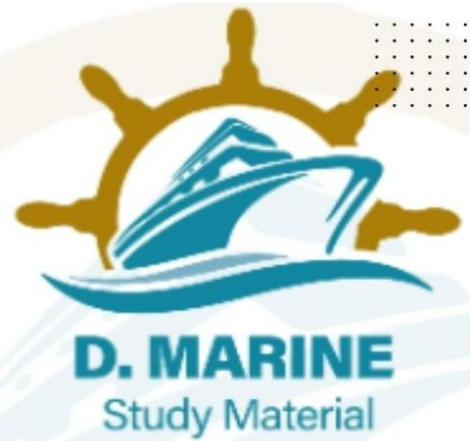
2026/FEB/Q9

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MARCH - 2026

Q1. (a) What are the various Static stresses that act on a vessel at rest in still water? Explain with the aid of sketches. (10)

(b) Give examples for dynamic stresses on a vessel? (6)

2024/SEP1/Q1 **2025/APR2/Q1** **2026/MAR/Q1**

[Click Here to See the Answer](#)

Q2. (a) What is bilging and What are the effects of bilging? (8)

(b) How are bulkheads classified? (3)

(c) What are the advantages of water tight bulkheads? How is the water tight bulkhead tested?

2023/MAY1/Q3 **2023/JUN/Q2** **2024/MAR/Q2** **2024/SEP1/Q2**

2025/APR2/Q2 **2026/MAR/Q2**

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Q3. Explain the meaning and purpose of EACH of the following terms:

(a) Flare (3)

(b) Bulwark (3)

(c) Coaming (3)

(d) Freeing port (3)

(e) Scupper (2)

(f) Rise of floor (2)

2024/MAR/Q3 **2024/SEP1/Q3** **2025/APR2/Q3** **2026/MAR/Q3**

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Q4. a) Sketch a semi balanced rudder showing: (10)

i) A detail of the hinges or pintles about which rudder turns

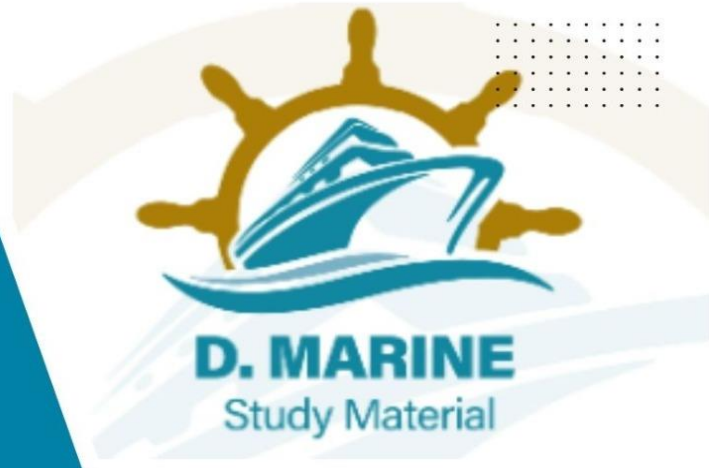
ii) Details of the rudder carrier bearing, which supports the weight of the rudderstock and rudder

b) State advantages of semi balanced rudder over an unbalanced rudder (3)

c) What acts as "rudder stops"? What is their purpose and at what angle from mid position would you expect the rudder stops to be set (3)



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2023/MAR/Q1 **2024/MAR/Q4** **2024/SEP1/Q4** **2025/APR2/Q4**
2026/MAR/Q4

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Q5. a) What is free surface effect. (6)

b) Explain the methods used to reduce the free surface effect in ship construction and while operating the ship. (10)

2023/FEB/Q4 **2023/MAY1/Q4** **2023/JUN/Q4** **2023/SEP/Q5**
2024/JAN/Q5 **2024/SEP1/Q5** **2024/DEC1/Q5** **2025/APR2/Q5**
2025/NOV/Q5 **2026/MAR/Q5**

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Q6. (a) Compare Fixed pitch (FP) with controllable pitch propellers (CPP).

(b) When a mass of 6 t is moved transversely through a certain distance on a ship of 4300 t displacement, the deflection of an 11 m pendulum is found to be 120 mm. The transverse meta-centre is 7.25 m above the keel and KG 5.46 m. Find the distance through which 6 t was moved (10)

2026/MAR/Q6

[Click Here to See the Answer](#)

Q7. (a) What are the various resistances acting against the motion of the ship? (6)

(b) A vessel of 10000 t displacement burns 25 t of fuel per day when her speed is 12 knots. Calculate the probable consumption of fuel over a voyage of 3000 nautical miles at a speed of 11 knots with a displacement of 11000t. (10)

2026/MAR/Q7

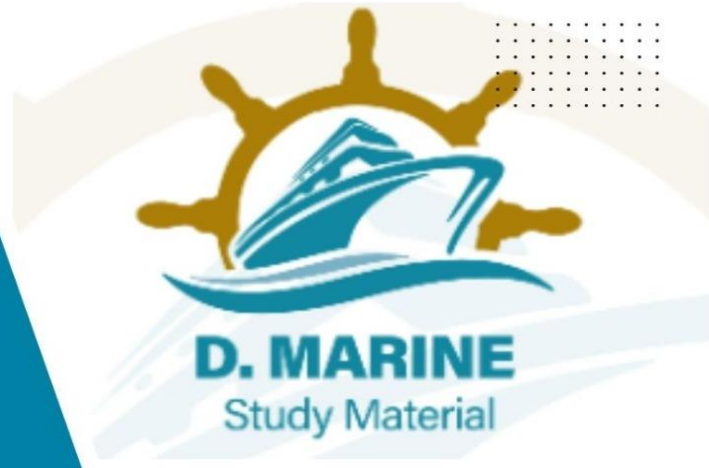
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Q8. (a) Explain why the draught of a ship decreases when it passes from fresh water to seawater and vice versa (6)

(b) A bulkhead 9 m deep is supported by vertical stiffeners 750 mm apart. The bulkhead is flooded to the top edge with sea water on one side only. Calculate: (10)



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- (a) Shearing force at top
- (b) Shearing force at bottom
- (c) Position of zero shear

2024/MAY1/Q6 **2024/SEP1/Q8** **2025/OCT/Q6** **2026/MAR/Q8**

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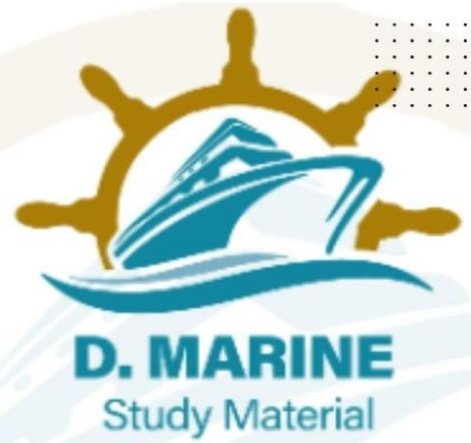
Q9. (a) With aid of a simple sketch, show the normal positions of centre of gravity of a stable ship relative to keel, centre of buoyancy and meta centre.
(b) A ship has 300 t of cargo in the hold, 24 m forward of the midships. The displacement of the vessel is 6000 t and its centre of gravity is 1.2 m forward of midships. Find the new position of the centre of gravity if this cargo is moved to an after hold, 40 m from midships. (10)

2023/APR/Q9 **2024/MAR/Q9** **2024/SEP1/Q9** **2025/APR2/Q9**
2026/MAR/Q9

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APRIL - 2026

Q1. With regards to the metacentric height which of the following statements is true (16)

- (a) It is used to indicate the quality of initial stability
- (b) It is located below the center of buoyancy
- (c) It is measured vertically above the center of buoyancy
- (d) Its determination is the objective of the inclining experiment

Briefly justify your answer

2023/APR/Q4 **2024/MAY2/Q3** **2024/AUG/Q3** **2025/MAR/Q3**
2025/JUL/Q1 **2025/DEC/Q3** **2026/APR/Q1**

[Click Here to See the Answer](#)

Q2. Explain the meaning and purpose of EACH of the following terms

- (a) Bulbous bow (4)
- (b) Hawse pipe (4)
- (c) Spurling pipe (4)
- (d) Cable stopper (4)

2024/APR2/Q2 **2025/JAN1/Q2** **2025/JUL/Q2** **2026/APR/Q2**

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Q3. Define the main purpose of the following tank and pumping system in detail

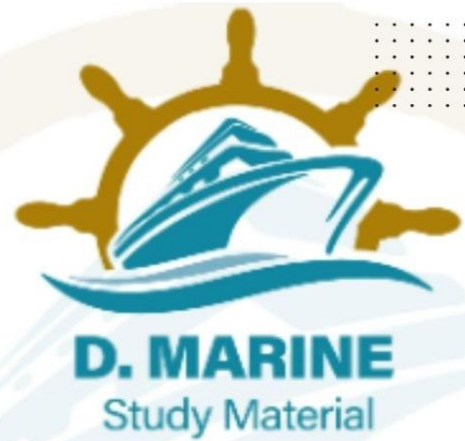
- (a) Weighted cocks on tank sounding pipes (4)
- (b) Remote operated gear for bilge valves (4)
- (c) Ventilation pipes for double bottom tanks (4)
- (d) Explain why gauze is sometimes fitted to tank ventilation pipes and explain the effect of mesh size (4)

2022/SEP/Q4 **2023/MAR/Q4** **2023/MAY2/Q3** **2024/FEB/Q2**
2024/APR2/Q3 **2024/SEP2/Q1** **2024/NOV/Q2** **2025/JAN1/Q3**
2025/JUL/Q3 **2026/APR/Q3**

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Q4. Sketch a plain bulkhead showing connections to deck sides and double bottom and the arrangement of stiffeners (16)

2024/APR2/Q4 **2025/JAN1/Q4** **2025/JUL/Q4** **2026/APR/Q4**

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Q5. Write short notes on each of the following with respect to their contribution to the strength of ships

- (a) Strake (4)
- (b) Bracket (4)
- (c) Stringer (4)
- (d) Girder (4)

2024/APR2/Q5 **2025/JAN1/Q5** **2025/JUL/Q5** **2026/APR/Q5**

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Q6. (a) Describe the provisions of additional structural strength to withstand pounding (6)

(b) A vessel travelling at 17 knots turns with a radius of 450 m when the rudder is put hard over The centre of gravity is 7 m above the keel the transverse metacentre 7.45 m above the keel and the centre of buoyancy 4 m above the keel If the centripetal force is assumed to act at the centre of buoyancy calculate the angle of heel when turning The rudder force may be ignored (10)

2022/AUG/Q8 **2024/APR2/Q6** **2025/JAN1/Q6** **2025/JUL/Q6**

2026/APR/Q6

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Q7. (a) Show by means of diagrams how the center of gravity of the liquid in a partly filled tank moves during rolling (6)

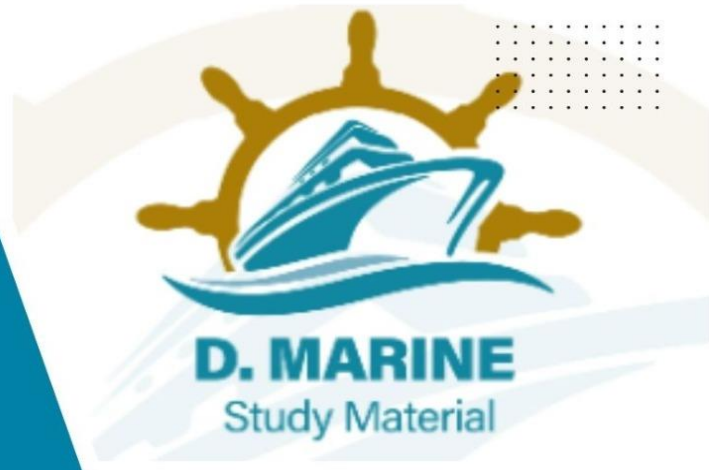
(b) A box barge is 15 m long 6 m wide and floats in water of 1.016 t/m^3 at a draught of 3 m 150 tonne of cargo is now added Calculate the load exerted by the water on the sides ends and bottom (10)

2024/APR2/Q7 **2025/JAN1/Q7** **2025/JUL/Q7** **2026/APR/Q7**

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Q8. (a) Explain what is meant by assigned summer freeboard (6)
(b) A box shaped vessel 60 m long 10 m beam and 6 m deep is floating in salt water at drafts 4 m forward and 4.4 m aft Find how far forward of amidships a weight of 30 tonnes must be loaded if the draft aft is to remain at 4.4 m (10)

2024/APR2/Q8 **2025/JAN1/Q8** **2025/JUL/Q8** **2026/APR/Q8**

[Click Here to See the Answer](#)

Q9. (a) Explain why the TPC for a given draught will vary with the density of the water in which the ship floats (6)
(b) A box shaped ship with 12 m beam is floating upright at a draft of 6.7 m Find the increase in draft if the vessel is now listed 18 degrees (10)

2024/APR2/Q9 **2025/JAN1/Q9** **2025/JUL/Q9** **2026/APR/Q9**

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