CBCS SCHEME

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21MR63

Sixth Semester B.E. Degree Examination, June/July 2024
Naval Architecture

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the following in short :
i) Density
ii) Relative density
iii) Archimedes principle
iv) Displacement
v) Buoyancy. **(10 Marks)**

b. A ship displaces 12,240m^3 of sea water at a particular draught,
i) Calculate the displacement of the ship
ii) How many tones of cargo would have to be discharged for the vessel to float at the same draught in F.W? **(10 Marks)**

OR

2 a. A box barge 40m long and 9m wide floats in sea water at a draught of 3.5m. Calculate the man of the barge. **(04 Marks)**

b. A piece of brass (rd8.4) 0.06m^3 in volume is suspended in oil of rd 0.8. Calculate the apparent mass of the brass. **(06 Marks)**

c. A bulkhead 9m deep is supported by vertical stiffeners 750mm apart. The bulkhead is flooded to the top edge with sea water on one side only. Calculate :
i) Shearing force at top
ii) Shearing force at bottom
iii) Position of zero shear. **(10 Marks)**

Module-2

3 a. Explain the following in detail :
i) C_w ii) C_m iii) C_b iv) C_p. **(16 Marks)**

b. A ship of 5000 tonne displacement has a man of 200 tonne on the fore deck 55m forward of midships. Calculate the shift in the C.G of the ship if the mass is moved to a position 8m forward of mid ships. **(04 Marks)**

OR

4 a. A ship of 10,000 tonne displacement has a mass of 60 tonne lying on the deck. A derrick, whose head is 7.5m above the C.G of the mass, is used to place the mass on the tank top 10.5m below the deck. Calculate the shift in the vessel's centre of gravity when the mass is :
i) Just dear of the deck
ii) At the derrick head
iii)In its final position. **(12 Marks)**

b. A ship of 5000 tonne displacement, 95m long, floats at a draught of 5.5m. Calculate the wetted surface area of the ship :
i) Using Denny's formula
ii) Using Taylor's formula with c = 2.6. **(04 Marks)**

c. The wderplane area of a ship is 1730m^2. Calculate the TPC and the increase in draught if a mass of 270 tonne is added to the ship. **(04 Marks)**

Module-3

5 a. A box barge of length L and breadth B floats at a level keel draught d. Calculate the height of the transverse meta centre above the keel. **(14 Marks)**

b. A mass of 6 tonne is moved transversely through a distance of 14m on a ship of 4300 tonne displacement, when the deflection of an 11m pendulum is found to be 120mm. The transverse meta-centre is 7.25m above the keel. Determine the height of the C.G. above the keel. **(06 Marks)**

OR

6 a. A ship of 12,000 tone displacement ha a second moment of area about the centerline of $72 \times 10^3 m^4$. If the meta centric height is –0.05m, calculate the angle of loll. **(10 Marks)**

b. A ship of 5000 tonne displacement has a rectangular tank 6m long and 10m wide. Calculate the virtual reduction in meta centric height if this tank is partly full of oil. (rd 0.8). **(10 Marks)**

Module-4

7 a. Explain the following in brief :
i) TRIM ii) LCF iii) Mean draught iv) Effect of adding small masses. **(12 Marks)**

b. A ship of 10,000 tonne displacement has a water plane area of $1300m^2$. The ship loads in water of $1.010t/m^3$ and moves into water of $1.026t/m^3$. Find the change in mean draught. **(08 Marks)**

OR

8 a. The residuary resistance of a model 7m long is 20N when towed at 3½ knots. Calculate the power required to overcome the residuary resistance of a similar ship 140m long at its corresponding speed. **(10 Marks)**

b. What are the factors the frictional resistance of a ships depends upon? **(04 Marks)**

c. A ship travelling at 20 knots requires 12,000 KW shaft power calculate the shaft power at 22 knots if, within this speed range, the index of speed is 4. **(06 Marks)**

Module-5

9 a. Explain the relation between the different speed through a line diagram. **(10 Marks)**

b. Explain the following in brief : i) A_p ii) Developed Area iii) BAR iv) DAR. **(10 Marks)**

OR

10 a. A ship with a meat centric height of 0.4m has a speed of 21 knots. The C.G is 6.2m above the keel while the centre of lateral resistance is 4m above the keel. The rudder is put hard over to port at the vessel turns in a circle 1100m radius. Calculate the angle to which the ship will heel. **(06 Marks)**

b. Explain how are of rudder is determined. **(04 Marks)**

c. Derive an expression for single of Heel when turning. **(10 Marks)**

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