USN | | | | | | | | | | **18MR52**

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Define the Geometry of ship with the help of a neat sketch. **(08 Marks)**
   b. A fore peak bulkhead is 4.8m deep and 5.5m wide at the deck. At regular intervals of 1.2m below the deck, the horizontal widths are 5.0, 4.0, 2.5, and 0.5m respectively. The bulkhead is flooded to the top edge with sea water on one side only. Calculate :
   i) are of bulkhead   ii) load on bulkhead   iii) position of centre of pressure **(12 Marks)**

OR

2 a. A double bottom tank extends from the centreline to the ship side. The widths of the tank surface at regular intervals of h, are y_1, y_2, y_3, y_4 and y_5. Calculate the 2nd moment of area of the tank surface about a longitudinal axis through its centroid. **(12 Marks)**
   b. Explain in brief about "LOAD ON AN IMMERSED PLANE". **(08 Marks)**

Module-2

3 Explain the following in detail :
   i) C_w ii) C_m iii) C_p iv) C_b **(20 Marks)**

OR

4 a. An oil tanker of 17000 tonne displacement has it centre of gravity 1m aft of midships and has 250 tonne of oil fuel in its forward deep tank 75m from midships. This fuel is transferred to the after oil fuel bunker whose centre is 50m from midships. 200 tonne of fuel from the after bunker is now burned. Calculate the new position of the centre of gravity.
   (i)   after the oil has been transferred
   (ii) after the oil has been used. **(10 Marks)**
   b. A vessel of 8000 tonne displacement has 75 tonne of Cargo on the deck. It is lifted by a derrick whose head is 10.5m above the centre of gravity of the Cargo, and placed in the lower hold 9m blow the deck and 14m forward of its original position. Calculate the shift in the vessel's centre of gravity from its original position when the Cargo is :
   (i)   just clear of the deck
   (ii) at the derrick head
   (iii) in its final position. **(10 Marks)**

Module-3

5 a. A ship of 5000 tonne displacement has a rectangular tank 6m long and 10m wide. Calculate the virtual reduction in metacentric height if this tank is partly full of oil (r.d) 0.8. **(08 Marks)**
   b. Explain briefly about "ADMIRALTY CO-EFFICIENT". **(12 Marks)**

OR

6 a. Explain about FREE SURFACE EFFECT in detail. **(12 Marks)**
   b. A ship's speed was 18knots. A reduction of 3.5knots gave a saving in fuel consumption of 22 tonne per day. Calculate the consumption per day at 18knots. **(08 Marks)**

Module-4

7 A ship 125m long has a displacement of 4000 tonne with LCG 1.60m aft of midships. The following items are now added :

cargo 8500 tonne Lcg 3.9m forward of midships

fuel 1200 tonne Lcg 3.1m aft of midships

water 200 tonne Lcg 7.6m aft of midships

stores 100 tonne Lcg 30.5m forward of midships.

At 14000 tonne displacement the mean draught is 7.80m, MCTI cm 160 tonne m, LCB 2.00m forward of midships and LCF 1.5m aft of midships. Calculate the final draught.

(20 Marks)

OR

8 a. Explain the following :
i) Buoyancy ii) Reverse Buoyancy iii) Permeability
iv) Centre of floatation (LCF) v) Mean draught.

(15 Marks)

b. A ship of 10,000 tonne displacement has a water plane area of 1300m². The ship loads in water of 1.010t/m³ and moves into water of 1.026t/m³. Find the change in mean draught.

(05 Marks)

Module-5

9 a. Explain the following propeller terms :
i) Diameter ii) Pitch ii) Pitch Ratio
iv) Theoretical speed v) Apparent slip vi) True slip.

(12 Marks)

b. A ship of 8000 tonne displacement has a rudder of area 18m². The centre of lateral resistance is 4m above the keel while the centroid of the rudder is 2.35m above the keel. The maximum rudder angle is 35°. Calculate the angle of heal due to the force on the rudder if the latter is put hard over to port when travelling at 21 knots with a metacentric height of 0.4m.

(08 Marks)

OR

10 a. A ship with a metacentric height of 0.4m has a speed of 21 knots. The centre of Gravity 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 and the vessel turns in a circle 1100m radius. Calculate the angle to which the ship will heal.

(12 Marks)

b. Explain the following :
i) Projected Area (AP) ii) Developed Area
iii) Blade Area Ratio (BAR) iv) Disc Area Ratio (DAR)

(08 Marks)

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