CBCS SCHEME

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18MR52

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
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 Geometry of ship, with the help of a neat sketch. **(08 Marks)**

b. Derive p = ρgh with simple terms. **(04 Marks)**

c. A rectangular double bottom tank is 20m long, 12m wide and 1.5m deep and is full of sea water having a density of 1.025 tonne/m^3. Calculate the pressure in kN/m^2 and the load in MN on the top and bottom of the tank if the water is : i) at the top of the tank
ii) 10m up the sounding pipe above the tank top. **(08 Marks)**

OR

2 a. Explain Simpson's First Rule in detail. **(08 Marks)**

b. The half ordinates of a water plane 180m long are as follows :

Section	AP	½	1	2	3	4	5	6	7	8	9	9½	FP	
½ Ordinates	0	5	8	10.5	12.5	13.5	13.5	12.5	11	7.5	3.0	1.0	0	mtrs

Calculate : i) Area of water plane ii) Distance of centroid from midships
iii) Second moment of area of water plane about a transverse axis through the centroid. **(12 Marks)**

Module-2

3 a. Explain with the help of a neat sketch : i) Midship section area coefficient
ii) Block coefficient iii) Prismatic coefficient. **(10 Marks)**

b. Define TPC and obtain expression for TPC. **(05 Marks)**

c. A ship displaces 12240m^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 fresh water? **(05 Marks)**

OR

4 a. State and explain Archimedies principle. **(07 Marks)**

b. Explain the effect of a suspended mass. **(05 Marks)**

c. A ship of 4000 tonne displacement has its centre of gravity 1.5m aft of midships and 4m above the keel. 200 tonne of cargo are now added 45m forward of midships and 12m above the keel. Calculate the new position of the centre of gravity. **(08 Marks)**

Module-3

5 a. Explain how Metacentric height and Transverse Metacentre can be determined using an inclining experiment. **(12 Marks)**

b. A vessel of constant triangular cross – section has a depth of 12m and a breadth at the deck of 15m. Calculate the draught at which the vessel will become unstable if the centre of gravity is 6.675m above the keel. **(08 Marks)**

OR

6 a. Explain Frictional Resistance and Residuary Resistance. **(10 Marks)**

b. A plate drawn through fresh water at 3m/s has a frictional resistance of 12N/m^2. Estimate the power required to overcome the frictional resistance of a ship at 12 knots if the wetted surface area is 3300m^2 and the index of speed is 1.9. **(10 Marks)**

Module-4

7 a. Derive an expression for change in draughts due to added masses. **(10 Marks)**

b. A ship 150m long has draughts of 7.70m forward and 8.25m aft , MCTI cm 250 tonne m, TPC 26 and LCF 1.8m forward of midships. Calculate the new draughts after the following masses have been added :
50 tonne , 70 m aft of midships
170 tonne , 36 m aft of midships
100 tonne , 5 m aft of midships
130 tonne , 4 m forward of midships
40 tonne , 63 m forward of midships. **(10 Marks)**

OR

8 a. Derive an expression for change in trim due to change in density. **(10 Marks)**

b. A box barge 120m long and 8m beam floats at an even keel draught of 3m and has an empty compartment 6m long at the extreme fore end. The centre of gravity is 2.8m above the keel. Calculate the final draughts if this compartment is bilged. **(10 Marks)**

Module-5

9 a. Define the following terms related to Propeller :
i) Pitch ii) Wake iii) Apparent slip iv) True slip. **(08 Marks)**

b. Explain briefly about Cavitation. **(06 Marks)**

c. The power required to drive a ship at a given speed was 3400 KW and the pressure on the thrust 19.5 bar. Calculate the new thrust pressure if the speed is reduced by 12% and the corresponding power is 2900 KW. **(06 Marks)**

OR

10 a. Explain the following :
i) Angle of heel due to force on rudder ii) Angle of heel when turning. **(14 Marks)**

b. A rudder has an area of 15m^2 with its centre of effort 0.9m from the centre of stock. The maximum rudder angle is 35° and it is designed for a service speed of 15 knots. Calculate the diameter of the rudder stock if the maximum allowable stress in the stock is 55MN/m^2 and the rudder force parallel to the centre line of the ship is given by F = 580 A v^2 with 'v' in m/s. **(06 Marks)**

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