CBCS SCHEME

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18MR52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
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. With a sketch, explain how to use Simpson's first rule to calculate the area of any irregular shape. **(08 Marks)**

b. A ship 180m long has 1/2 widths of water plane of 1, 7.5, 12, 13.5, 14, 14, 14, 13.5, 12, 7 and 0m respectively calculate,
i) Water plane area
ii) TPC
iii) Water plane area coefficient. **(12 Marks)**

OR

2 a. What is C_w, C_m, C_b and C_p? **(08 Marks)**

b. A ship 140m long and 18m beam floats at a draught of 9m. The immersed cross sectional areas at equal intervals are 5, 60, 116, 145, 152, 153, 153, 151, 142, 85 and 0 m^2 respectively. Calculate:
i) Displacement
ii) Block coefficient
iii) Mid ship section are coefficient. **(12 Marks)**

Module-2

3 a. Explain the terms, GT, NT and DWT. **(09 Marks)**

b. A ship of 4000 tonne displacement has its centre of gravity 6m above the keel. Find the new displacement and position of the centre of gravity when masses of 1000, 200, 5000 and 3000 tonne are added at positions 0.8, 1.0, 5.0 and 9.5m above keel. **(11 Marks)**

OR

4 a. Explain TPC. How to calculate the cargo loaded on bulk carrier? **(08 Marks)**

b. The centre of gravity of ship of 5000 tonne displacement 6m above the keel and 1.5m forward of midship. Calculate the new position of the centre of gravity if 500 tonne of cargo are placed in the screen deck 10m above the keel and 36m after of midship. **(12 Marks)**

Module-3

5 a. A ship of 5000 tonne displacement has a rectangular double bottom tank 9m wide and 12m long, half full of seawater. Calculate the virtual reduction in metacentric height. **(10 Marks)**

b. What is frictional resistance? Explain state the factors that are affecting frictional resistance. **(10 Marks)**

OR

6 a. A vessel of 10000 tonne displacement has a second moment of area of water plane about the centerline of $60 \times 10^3 m^4$. The centre of buoyancy is 2.75m above the keel. The following are the disposition of the masses on board the ship.
4000 tonne 6.30m above the keel
2000 tonne 7.50m above the keel
4000 tonne 9.15m above the keel.
Calculate the meta centric height. **(10 Marks)**

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

Module-4

7 A ship of 5000 tonne displacement, 96m long, floats at draughts of 5.6m forward and 6.30m aft. The TPC is 11.5, GML 105m and centre of flotation 2.4m aft of midships. Calculate,
i) The MCT 1cm
ii) The new end draughts when 88 tonne are added 31m forward of midships. **(20 Marks)**

OR

8 A ship 125m long has a light displacement of 4000 tonne with LCG m aft of midships. The following items 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 sotres 100 tonne Lcg 30.5m forward of midships.
At 14000 tonne displacement the mean draught is 7.8m, MCTI cm 160 tonne m, LCB 2.0m forward of midships and LCF 1.5m aft of midships. Calculate the final draughts. **(20 Marks)**

Module-5

9 a. Explain:
i) Diameter D
ii) Pitch P
iii) Theoretical speed
iv) Apparent slip of a propeller. **(08 Marks)**

b. A vessel travelling at 17 knots turns with a radius of 450m when the rudder is put hard over. The centre of gravity in 7m above the keel, the transverse meta centre 7.45m above the keel and the centre of buoyancy 4m 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. **(12 Marks)**

OR

10 a. A ship of 15000t displacement has admiralty coefficient, based on shaft power, of 420. The mechanical efficiency of the machining is 83%, shaft losses 6%, propeller efficiency 65% and QPC 0.71. At a particular speed the thrust power is 2550kW. Calculate:
i) Indicated power
ii) Effective power
iii) Ship speed. **(15 Marks)**

b. What is Cavitation? Explain. **(05 Marks)**

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