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10MR62

Sixth Semester B.E. Degree Examination, June/July 2016
Naval Architecture – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Draw and explain the propeller terms and Geometry of screw propeller. **(08 Marks)**

b. A ship at a speed of 15 knots has the following particulars P_s = 3050kw ; rev/min = 95 ; propeller thrust = 358kN ; apparent slip = 0. For a Froude wake factor of 0.45 and a thrust deduction factor of 0.20 determine the real slip and the P_E. **(08 Marks)**

c. A single screw ship having C_B = 0.70 was found to have a speed on trial of 16.06 knots. The Froude wake fraction was estimated at 0.43. Estimate the speed of wake. **(04 Marks)**

2 a. Explain Blade element theory of propeller. **(10 Marks)**

b. Write short note on ship self propulsion test. **(05 Marks)**

c. Mention the various experiments carried out on ship models and model propellers to determine the performance of the propeller and hull propeller interaction. **(05 Marks)**

3 a. 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 15knots. Calculate the diameter of the rudder stock if the maximum allowable stress in the stock is $55MN/m^2$ and rudder force parallel to the centerline of the ship is given by $F = 580\ Av^2$ Newton with V in m/s. **(06 Marks)**

b. A ship of 8000 tonne displacement has a rudder of area $18m^2$. The centre of lateral resistance is 4m above the keel. While the centroid of rudder is 2.35m above the keel. The maximum rudder angle is 35°. Calculate the angle of heel 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. **(06 Marks)**

c. What is area of the rudder to be fitted, if the length of the ship is 150m and it has a draught of 9m. (i) for fast ships (ii) for slow ships. **(02 Marks)**

d. 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 diameter. Calculate the angle to which the ship will heel. **(06 Marks)**

4 a. With the neat sketch explain the various phases of turning circle. **(08 Marks)**

b. Explain with the neat sketch why the rudder is fitted is the aft and not in the bow of a ship? **(08 Marks)**

c. Mention various types of rudder and other maneuvering devices used on ships. **(04 Marks)**

PART – B

5 a. The ordinates of the curve of buoyancy for the fore body of a ship at stations 10.7m apart commencing from the forward perpendicular are 0, 21.7, 48.3, 81.0, 113.0, 136.5 and 143.0 tonnes per metre of length of vessel. The weight distribution throughout the fore body is uniformly 73.0 tonnes per metre. Draw the curves of load, shearing force and bending moments and state the maximum values for the SF and BM and the values at amidships. **(15 Marks)**

b. Write short note on still water bending moment with diagram. **(05 Marks)**

6 a. The width of a bulkhead commencing at the top and at intervals of 1.5m are as follows: 6.1, 5.5, 4.6, 3.6 and 2.4 meters. The bulkhead is flooded on one side to the top with seawater. Determine the area of and the pressure on the bulkhead together with the centre of pressure. **(08 Marks)**

b. A peak bulkhead is in the form of a trangle, apex down, 6m wide at the top and 9m deep. The tank is filled with sea water. Calculate the load on the bulkhead and the position of the centre of pressure relative to the top of the bulkhead if the water is 4m up the sounding pipe. **(03 Marks)**

c. Derive expression to find centre of pressure from the surface for (i) rectangular plane (ii) Triangular plane (iii) Circular plane. **(09 Marks)**

7 a. Define the following terms :

i) Significant wave height
ii) Significant wave amplitude
iii) Modal frequency
iv) Modal period
v) Regular waves
vi) Irregular waves. **(12 Marks)**

b. What is RAO? Mention its formula. **(03 Marks)**

c. Explain various motions of ship on waves. **(05 Marks)**

8 a. A ship has a length of 97.5m ; breadth 10.65m ; draught 3.35m ; transverse metacentric height = 0.76m ; longitudinal metacentric height = 110m.
K_{T+} = 3.65m; K_L = 24.4m ; C_B = 0.54 ; C_w = 0.70. Determine the natural periods of (i) rolling (ii) Pitching and (iii) heaving. **(06 Marks)**

b. A ship of 5600 tonnes displacement has a transverse metacetric height of 0.91m, a period of 15 seconds and a horizontal curve of metacentres. Determine the period when 25 tonnes are added at a height of 20m above the ships centre of gravity. **(08 Marks)**

c. What are the types of roll stabilizers? Write short note on roll stabilizer. **(06 Marks)**

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