B. Tech. Degree VI Semester Examination in Marine Engineering June 2014

MRE 607 NAVAL ARCHITECTURE II

Time : 3 Hours   Maximum Marks :100

(All questions carry *EQUAL* marks)

(5 x 20 =100)

I. (a) What are the static forces and dynamic forces acting on a ship? Briefly explain. (5)

(b) A ship of rectangular shape 100m long is having 20,000t evenly distributed with load. (15)
Another load of 10,000t is now placed amidships for a length of 40m, evenly.
Find out:
   (i)   Weight curve
   (ii)   Buoyancy curve
   (iii) Load curve
   (iv)   Shear force curve
   (v)   Bending moment curve
   (vi)   Specify whether the ship in 'hogging' or sagging condition.

OR

II. (a) Briefly explain the effect of waves on the loading on ship and its bending moment. (5)

(b) A ship of midship section as shown below has uniform thickness of 12mm. Calculate (15)
the section modulus at deck and bottom. Find out the stress at deck and bottom when a
bending moment of 600 MN_M is acting.
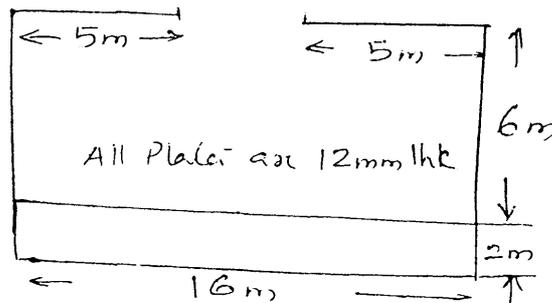
III. (a) Draw sketches showing the views of a screw propeller and mark the parts root, tip, (5)
hub, shaft, leading edge, trawling edge, skew and rake.

(b) The pitch angle measured at 4 meters from centre of the propeller is 18.5 degrees. (15)
Find (i) The pitch of the propeller (ii) If the dia of propeller is 8m calculate the P/D
ratio and pitch angle at tip.

OR

IV. A propeller is having a pitch of 5.5m speed of 3.5 rev/second. Delivered power is (20)
2300kW and efficiency of propeller = 70%. If the ship speed is 14Kn and speed of
advance is 11.5 knots calculate: (i) Real slip (ii) Wake factor (iii) Propeller thrust.

V. (a) Explain balanced, unbalanced and semi-balanced rudders with suitable sketches. (5)

(b) A rudder has an area of 16m^2 with the centre of effort 0.95m from centre of stock. The (15)
maximum rudder angle is 35° and to be designed for a service speed 15 knots.
Calculate diameter of rudder stock if the maximum allowable stress is 55MN/m^2 and
the rudder force parallel to the centre line of the ship is given by F = 580 AV^2 Newtons
where v in M/sec.

OR

(P.T.O.)

VI. A ship of 10,000t displacement has a rudder of 24m² area. The ship has a GM of 0.6m (20)
and KG of 6.7 meters. The centre of lateral resistance is 4.2 meters above keel. The
maximum rudder angle is 35° and the centroid of rudder is 2.3m above keel.
Find the following:
  (i)   The angle and direction of heel due to the force on rudder when it put
        hard to PORT when ship is travelling at 18 knots.
  (ii) The angle and direction of heel due to centrifugal force when ship is
        turning at 900M at 18 knots.

VII. (a) Explain various powers of the power train of ships starting from indicated power of (10)
           main engine to effective power. What are the Propulsive Co-efficient (PC) and Quasi-
           Propulsive Coefficient (QPC)?
      (b) What are the different types of 'motion stability'? Describe with suitable sketches. (10)
                                        OR
VIII. (a) Explain how a trochoidal wave is generated. Derive the equation of the wave. (10)
           Explain how the line of orbit centres and undisturbed water lever is related.
      (b) What is sea spectrum? Briefly explain. (10)

IX.   Write short notes on *any four* of the following: (4 x 5 = 20)

      (i)   Strength, duration and fecth
      (ii)   Wave frequency, wave number and wave velocity
      (iii) Propeller cavitation
      (iv)   Anti-rolling devices
      (v)   Sea state
      (vi)   Sagging and hogging

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