BT–MRE–VI–05.19-0879 Reg. No. | | | | | | | | |

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B.Tech. Degree VI Semester Examination in Marine Engineering May 2019

MRE 1607 NAVAL ARCHITECTURE II

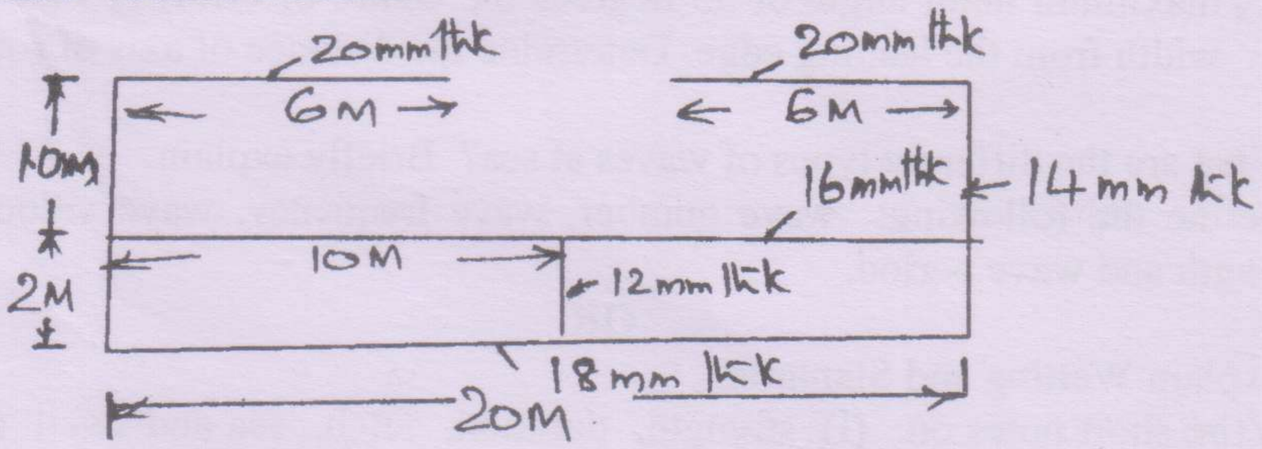
(2013 Scheme)

Time : 3 Hours Maximum Marks : 100

(5 × 20 = 100)

I. (a) Mid-ship section of a ship is given below: (17)

Calculate Section modulus



(b) If the maximum bending moment acting on the above section is 890 MNm, calculate the stresses acting on bottom shell, Tank top and at Desk. (3)

OR

II. (a) The hull of a 80 m long rectangular barge has a uniformly, distributed mass of 640 t over the length. Machinery weight 200 t is at amidship for a length of 20 m. End tanks at aft and forward of 20 m length each are loaded 340 t each. Construct the curves of load, SF, and BM. (14)

(b) Find: (i) location and values of maximum SF and BM.
(ii) Value of SF and BM at 25 m from aft. (6)

III. (a) Define P.C and Q.P.C. Derive it in terms of efficiencies. (3)

(b) Following are the details obtained during acceptance trials of a ship: (17)
Ship speed = 15.4 knots, Delivered power to propeller = 2500 kW, Effective power 1730 kW, Propeller Thrust = 274 KN, Propeller speed = 1.75 rps, Propeller efficiency = 64%, Pitch ratio = 0.75 Apparent slip = 5%. Calculate (i) Thrust deduction factor (ii) Taylor's wake fraction (iii) Propeller diameter.

OR

IV. (a) Draw the profile of a propeller and mark the following dimensions/parts: Diameter, Root dia, Rake, Tip, Face, Back. (4)

(b) A propeller of 6 m diameter have pitch ratio = 0.9, B.A.R = 0.48, rpm = 110, real slip ratio = 0.25, wake fraction = 0.3, propeller thrust = 700 KN and propeller efficiency = 0.65. Calculate: (i) Blade area (ii) Average pressure on the blade surface (iii) Ship speed (iv) Thrust power (v) Delivered power (vi) Torque on the shaft. (16)

V. (a) Derive the angle of heel when the ship is taking a turning circle. (8)

(b) Force parallel to ship's centre line is given by $F = 577\ Av^2$ newtons. (12)
A = rudder area insq.m, v = ship speed in m/sec. Rudder size is 5.5. m deep and 3.5 width with it's axis of rotation 0.4 m from leading edge. At an angle of rudder at 35 degrees the centre of effort is 32% of rudder width from leading edge.
Maximum shear stress of rudder stock material is 70 MN/sq.m Calculate the following: (i) Minimum dia of rudder stock (ii) Speed to be restricted if the diameter is reduced by 20 mm due to corrosion.

OR

(P.T.O.)

VI. (a) What are the different types of rudders? Explain with sketches. (4)

(b) The force acting normal to the plane of rudder is given by the expression: $Fn = 20.17\ Av^2 \times$ alpha Newtons.
A = rudder area v = speed of ship in m/sec. alpha = rudder angle in degrees.
A manoeuvrability specification for a ship that requires a transverse rudder force (Ft) of 75 KN is generated when angle of helm is 35 degrees when ship is travelling at a speed of 5 knots.

(i) Determine suitable dimensions of a rudder having depth to width ratio of 1.6. (6)

(ii) The rudder stock is designed to have a diameter = 320 mms with the allowable shear stress = 70 MN/sq.m at it's service speed of 15 knots. At maximum helm angle of 35 degrees the centre of effort is 34% of rudder width from the leading edge. Determine the distance of axis of rotation. (10)

VII. (a) What are the different types of waves at sea? Briefly explain. (10)

(b) Define the following: wave number, wave frequency, wave velocity, wave length and wave period. (10)

OR

VIII. (a) Explain Wetting and Slamming. (5)

(b) Write short notes on: (i) strength, duration, fetch, sea and swell (ii) Wave spectrum (iii) Anti-rolling tanks. (15)

IX. (a) Explain 2-node vertical mode & 3-node horizontal mode hull vibration on ships with suitable sketches. (10)

(b) What are the causes/consequences of vibration on ships? Describe. (10)

OR

X. (a) Define the following w.r.t. Vibration: mode, node, anti-node, frequency and amplitude. (10)

(b) Define the term 'Resonance' and explain its significance w.r.t ship's propulsion system. (4)

(c) Describe how the hull vibration can be minimized in a vessel (i) in the design stage (ii) on the vessel already built. (6)

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