B. Tech. Degree VI Semester Examination in Marine Engineering June 2016
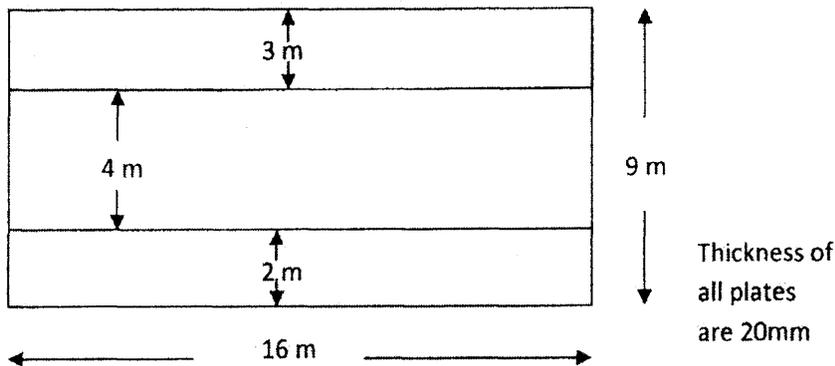
MRE 1607 NAVAL ARCHITECTURE II

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

I.   (a)   Mid ship section of a ship of breadth = 16 m and depth = 9 m is given under .   (15)
Thicknesses of all sections are 20 mms. Find moment of inertia about neutral axis.

   (b)   Calculate the bending stresses at upper deck, tween deck, tank top and bottom   (5)
plate when a sagging bending moment at 4000 tm is applied.

OR

II.   (a)   Describe the procedure for evaluating the shear force and bending moment   (5)
along the length of a ship.

   (b)   A rectangular barge of 100 m long has 900 t hull weight uniformly distributed   (15)
along the length.
Machinery at of 300 t is uniformly distributed amid ships for a length of 30 m.
End tanks each having a length of 20 m are loaded with 400 t in each tank.
Prepare the weight curve, buoyancy curve, SF & BM curves in still water.
Find max value of BM.
Find SF & BM at 30 m from end.

III.   (a)   What is SCF (ship correlation factor) in calculation of EHP of a ship from   (2)
model test?

   (b)   Details of propeller of a ship are: pitch angle measured at 2 m from centre of   (18)
boss = 21.5 degrees, RPM = 120, P/D = 0.8, Ship speed = 16 kn, Sr = 25%.
Find Sa, w, Dia of propeller and pitch angle at tip.

OR

IV.   (a)   Show the following parts/dimensions on appropriate sketches of a propeller   (5)
diameter, trailing edge, leading edge, rake, skew, tip and root.

   (b)   Following are the data obtained during sea trails of a ship: Propeller dia = 6 m,   (15)
P/D ratio = 0.85, Propeller thrust = 645 KN, Delivered power to the
propeller = 5900 kw, Propeller thrust = 645 KN, Sr = 0..33, w = 0.31,
QPC = 0.71, Propeller speed = 1.75 rps. Find (i) Speed of ship (ii) Sa.
(iii) Efficiency of propeller   (iv) Thrust deduction factor.

(P.T.O.)

V. (a) Describe with suitable sketch a typical rudder and define span, chord, aspect ratio, taper ratio, leading edge, trailing edge, root and tip. (10)

(b) Rudder of an area 20 m^2 with its center of effort 1.2 m from the center of stock is to be designed for a speed of 16 knots. Maximum rudder angle is 35 degrees. Calculate the dia of stock if the maximum allowable stress in the stock is 55 MN/M^2 and rudder force is given by F = 580 AV^2 newtons [A in sq. meter and V in m/sec]. (10)

OR

VI. (a) Explain different types of rudders with suitable sketches. (5)

(b) A ship of 12,000 t has a rudder area of 22 m^2. The center of lateral resistance is 4 m above the keel and the center of rudder is 2.35 m above keel. Maximum rudder angle is 35°. Find the angle of heel when rudder is put hard over to PORT when travelling at 20 knot speed with a metacentric ht of 0.5 m. Force acting on rudder is given by: F = 580 AV^2 newtons. {Area in sq. m and V in m/sec.}. (15)

VII. (a) Derive an equation of motion for a free rolling of a ship. Write down the expression for free rolling period. Explain how the loading and unloading effects the rolling period. (10)

(b) A ship of $\Lambda = 11,000t$ has a GM = 0.5 m. The period of roll in still water is 20 sec. A mass of 200 t is shifted vertically up by 6 m. Find the new period of roll. (10)

OR

VIII. (a) Compare the features of sinusoidal and trochoidal waves. (10)

(b) What is wetness and slamming in ship motion? (4)

(c) Write short notes on: (6)
   (i) Strength of duration, fetch, sea and swell.
   (ii) Wave spectrum.

IX. (a) With respect to hull vibration, explain with the aid of diagrams, each of the following. (6)
   (i) Two-NODE vertical mode.
   (ii) Three-NODE horizontal mode.

(b) What are the causes of vibration on ships? (4)

(c) Describe how the hull vibration can be minimized on vessels during design and on vessels already built. (10)

OR

X. (a) With reference to ship hull vibration, define each of the following terms. (10)
   (i) Frequency.
   (ii) Node.
   (iii) Anti-node.
   (iv) Mode.
   (v) Amplitude.

(b) Define resonance, explaining in terms of hull vibration and torsional vibration. (5)

(c) State three adverse effects of vibration. (5)

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