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***B. Tech. Degree VI Semester Examination in
Marine Engineering June 2015***

MRE 607 NAVAL ARCHITECTURE II

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) A block of wood 10 m long, 2 m wide and 0.24 m deep floats in fresh water. Density of wood is 800 kg/m^3 . Draw the buoyancy curve, weight curve, load curve and bending moment curve of the floating block in still water. (10)
- (b) A ship has a length of 120 m. The sectional areas at evenly spaced stations corresponding to the load water line are as follows: (10)

Station	0	1	2	3	4	5	6	7	8	9	10
Area (m ²)	4	48	102	144	144	144	144	144	98	35	0

Calculate the ordinates of the buoyancy curve in kN/m and plot the buoyancy curve if the ship floats in sea water of density 1.025 tonnes/m^3 .

OR

- II. A steel single deck rectangular pontoon barge is transversely framed and has no hatch openings. The breadth of the barge is 16 m and depth is 4.4 m. The plate thicknesses and girder sizes are as follows: (20)
- deck plate – 9 mm
side shell – 9 mm
bottom shell – 10 mm
deck centre line girder – $200 \times 8/80 \times 8$ T section
bottom centre line girder – $450 \times 8/120 \times 8$ T section
Calculate the section modulus at deck and at bottom.

- III. (a) Define pitch and pitch angle of a screw propeller. Show that for a screw propeller blade with constant pitch from root to tip, the pitch angle reduces from root to tip. (10)
- (b) A screw propeller has a dia of 6 m and constant pitch ratio of 0.8. The hub radius is 20% of the propeller radius. Calculate the pitch angles at the root, tip and at a radius $r = 0.7R$. (10)

OR

- IV. (a) Explain the axial momentum theory of screw propeller. (10)
- (b) Derive an expression for the thrust using axial momentum theory. (10)
- V. (a) Explain the terms wake fraction and thrust deduction fraction. (10)
- (b) Derive an expression for the hull efficiency in terms of the wake fraction and thrust deduction fraction. (10)

OR

- VI. (a) Explain the phenomenon of propeller cavitation. (8)
- (b) List the bad effects of cavitation. (6)
- (c) Describe three different methods to prevent cavitation. (6)

(P.T.O.)

- VII. (a) A ship achieves a speed of 15 knots with a propeller of dia 6 m and pitch ratio of 0.8 rotating at 120 rpm. Calculate apparent slip ratio and real slip ratio. Given wake fraction = 24%. (10)
- (b) A propeller rotating at an rpm of 120 and advancing at a speed of 6 m/s produces a thrust of 320 kN. The shaft torque just ahead of the propeller is 240 kN.m. Calculate the power delivered to the propeller, thrust power and propeller efficiency. (10)

OR

- VIII. (a) Draw a neat sketch of the profile view of a rudder and mark the following: (10)
(i) leading edge (ii) trailing edge (iii) root (iv) tip (v) span at leading edge
(vi) span at trailing edge (vii) root chord (viii) tip chord.
- (b) Define : (i) mean span (ii) mean chord (iii) aspect ratio (iv) taper ratio (10)
(v) thickness chord ratio.

- IX. Answer **ANY TWO** questions. (2 × 10 = 20)
- (a) Describe with sketches any two types of roll stabilizers.
- (b) Define the motions of a ship in 6 degrees of freedom using an axes system fixed on the ship. List the motions in the horizontal plane and vertical plane. Which of these motions have a restoring force or moment?
- (c) Define slamming. What are the bad effects of slamming on the ship?
- (d) Describe a turning circle manoeuvre. List the main parameters measured during the manoeuvre.
