

**B.Tech. Degree VI Semester Supplementary Examination in
Marine Engineering June 2022**

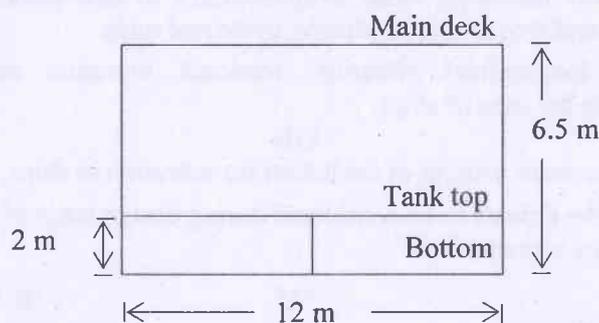
**MRE 1607 NAVAL ARCHITECTURE II
(2013 Scheme)**

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Explain the procedure to estimate the wave bending moment along the length of a ship (10)
- (b) Consider a vessel, of constant rectangular cross section, having length = 140 m, breadth = 20 m and depth = 13 m. The total mass of the vessel is 25800 t out of which 20800 t is distributed uniformly over the entire length and the remaining 5000t is distributed uniformly over a length of 10 m with its centre of gravity amidships. Draw the weight curve, buoyancy curve and the load curve. Calculate the still water bending moment amidships. (10)
- OR**
- II. (a) Describe the sagging and hogging conditions of ships in still water and in waves with the help of neat sketches. (8)
- (b) The midship section of a ship having breadth = 12 m and depth = 6.5 m is shown in the figure below. Assume that all plates and sections are of 14 mm thickness. Determine the bending stresses at the keel and the main deck if the ship is subjected to a sagging bending moment of 40 MNm. (12)



- III. (a) Briefly describe the following: (8)
- (i) vertical axis propeller
- (ii) controllable pitch propeller.
- (b) A model propeller of 0.41m diameter with a pitch ratio of 1.25 produces thrust of 266 N when advancing at a speed of 6.5 knots at 800 rpm and the torque is 16.4 Nm. Determine the pitch, rpm, thrust, torque, P_T , P_D and efficiency for a similar ship propeller of 4.3 m in diameter. (12)
- OR**
- IV. (a) With the help of neat sketches explain the following for a right handed screw propeller: leading edge, trailing edge, root, tip, rake, skew, face and back. (8)
- (b) The following are the data of a propeller: Diameter = 4.88 m, $K_Q = 0.015$, $K_T = 0.097$, $J = 0.633$, $N = 120$ rpm. Determine P_D , P_T , V_a and efficiency. (12)

(P.T.O.)

- V. (a) Derive the expression for the angle of heel due to force on the rudder. (10)
 (b) Describe the following for a rudder with the help of neat sketches: (10)
 leading edge, trailing edge, span, chord, thickness, root, tip, thickness chord ratio, taper ratio and aspect ratio.
- OR**
- VI. (a) Explain the classification of rudders based on degree of balancing. (6)
 (b) Briefly describe Zig-Zag manoeuvre. (9)
 (c) A ship turns to port in a circle of radius 100m at a speed of 15 knots. The GM_T is 0.67m and BG is 1m. Find the angle of heel due to turning. (5)
- VII. (a) Describe trochoidal wave theory. (10)
 (b) Find the still water period of roll for a ship if the radius of gyration is 6 m and the metacentric height is 0.5 m. Assume that there is no damping. (5)
 (c) A sinusoidal wave in deep water has a wavelength of 64 m. Find period, circular frequency and celerity of the wave. (5)
- OR**
- VIII. (a) Describe any two active and two passive antirolling devices used in ships. (10)
 (b) Explain various degrees of freedom of a ship with the help of neat sketches. (5)
 (c) If the weight of a component onboard a ship is 18000 kg, determine the maximum total force exerted on the foundation of the component due to the heaving motion of the ship if the heaving acceleration is found to be 0.75g where g is the acceleration due to gravity. (5)
- IX. (a) Describe the following terms with reference to hull vibrations: mode shape, natural frequency, amplitude, cycle and node. (15)
 (b) Describe longitudinal vibration, torsional vibration and flexural vibration in the case of ships. (5)
- OR**
- X. (a) Explain the main sources of excitation for vibration in ships. (15)
 (b) What are the aspects to be considered during design stage of a ship for reduction of vibration? (5)
