BT MRE–VI–05.17–0703 Reg. No. | | | | | | | | |

B

B.Tech. Degree VI Semester Examination in Marine Engineering May 2017

MRE 1607 NAVAL ARCHITECTURE II

(2013 Scheme)

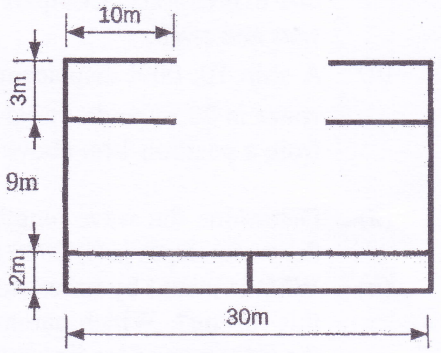
Time: 3 Hours Maximum Marks: 100

(Use neat sketches wherever necessary)

(5 × 20 = 100)

I. (a) Sketch typical shear force and bending moment distributions along the length of a fully loaded ship of normal hull form. Describe their main features, viz. location of maxima, minima etc. How are the sectional area curve and buoyancy distribution curve related? (8)

(b) A ship has the cross section shown. Bottom plate thickness = 15mm, main deck plate thickness = 16mm and all other plates are 10mm thick. Material of construction is mild steel with yield strength = 235MPa. Find the maximum bending moment the cross section can withstand before yielding occurs. (12)



OR

II. (a) Define sagging and hogging bending moments in ships and state the corresponding nature of stresses on main deck and keel of ship. Under what conditions these occur? Can hogging/sagging occur on a stationary ship in calm water? Explain the reasons. (8)

(b) A 120m barge with constant underwater hull form is divided into 5 equal compartments. The light ship weight of 2400t is evenly distributed over the length. Cargo of 2000t each is loaded into the three centre holds. Obtain shear force and bending moment distributions. (12)

III. (a) Explain effective power, hull efficiency, open water efficiency, relative rotative efficiency, shaft transmission efficiency, QPC, propulsive coefficient and MCR. (8)

(b) Describe fixed pitch propeller, variable pitch propeller, controllable pitch propeller, Kort nozzle propulsion and Voith Schneider propulsion. (12)

OR

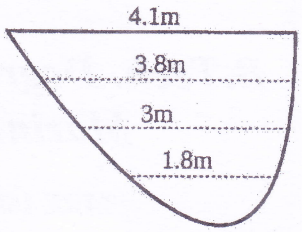
IV. (a) Explain the following features of a screw propeller with the help of neat sketches: diameter, boss, leading edge, trailing edge, skew, rake, projected outline and developed outline. (8)

(b) Explain cavitation and cavitation number. What are the effects of cavitation? What is supercavitating propeller? (12)

(P.T.O.)

V. (a) Compare the heeling action of a ship when the rudder is initially applied and during steady turn. What happens when the rudder angle is suddenly made to zero degree during steady turn? Derive an expression for steady heel angle during turning. (8)

(b) Calculate the force on the spade rudder shown at an angle of rudder 30 degree. Speed of ship is 20kn. The chord lengths are as indicated at equal spacings of 1m. (12)



OR

VI. (a) What are the factors influencing the lift force developed on the rudder? What is stalling? Why are hard stops used? (8)

(b) With respect to the turning of the ship, explain drift angle, advance, transfer, tactical diameter, pivoting point and loss of speed on turn. (12)

VII. (a) Gravity theory of ocean surface waves predicts the dispersion relation as: $c^2 = \frac{q}{k}\tanh(kH)$. Explain the terms. What is the physical meaning of this expression? Compare Stoke's wave to sinusoidal wave. Explain *fetch, seas* and *swell.* (8)

(b) A ship 10, 000t displacement has $GM_T = 0.5m$. The period of roll in still water is 20 seconds. Find the new period of roll if a mass of 50t discharged from a position 14m above the centre of gravity. (12)

OR

VIII. (a) Determine the wave length of a surface wave with period 10 seconds when the water depth is (i) 2000 meter and (ii) 2 meter. (8)

(b) What is meant by unresisted rolling? What is the importance of the period of this rolling? Which parameters influence unresisted rolling period? What is the influence of loading/unloading on this rolling period? (12)

IX. Answer ***any four***: (4 × 5 = 20)

(a) Define transverse vibration, longitudinal vibration and torsional vibration. Which part of the ship is most likely to undergo torsional vibration and why?

(b) Sketch the mode shapes for two noded and three noded vertical vibrations of ship hull and mark nodes and antinodes. Which mode, two noded or three noded, will have higher frequency? A ship in light and fully loaded condition executes two noded vibrations. Which condition will have higher frequency of vibration and why?

(c) Explain how the stiffness and mass of a spring mass system related to its natural frequency. Describe resonance and its consequence. Is there a possibility to occur resonance in ships? If yes, cite an example.

(d) A main engine structure of a ship in service is found to be resonating under certain RPM. What solution would you suggest to overcome this situation if you want run at this RPM?

(e) Which are the main sources of excitation in a ship? Explain how these excitations are generated.

(f) Explain the purpose and working principle of anti-vibration mounts used to fit main engine.

(g) Is vibration a friend or foe? Substantiate.

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