

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations –June 2023**  
**Programme Name: B Tech (ME)**  
**Semester: VI**

**Subject Code: UG11T3605**

**Subject Name: Naval Architecture II**

Date: 05.06.2023	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

**Section A**

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

Q1. When a ship moves through the water at any speed, a force is exerted by the water on the ship which has to be overcome is called as .....

- a. Torque
- b. Thrust
- c. Resistance
- d. None of the above

Q2. The primary purpose of fitting a bulbous bow is to:

- a) Strengthen the bow.
- b) Improve resistance to pounding.
- c) Improve propulsive efficiency.
- d) Improve the appearance of the ship.

Q3. An allowance made for the appendages and also the general disturbance of the water at sea compared with towing tank conditions is known as:

- a) Admiralty coefficient
- b) Ship correlation factor (SCF)
- c) QPC
- d) Thrust deduction fraction

Q4. In propeller open water testing, the feathering condition is referred as when

- a) The Thrust and Torque Coefficients are maximum with  $J=0$
- b) The thrust coefficient  $K_T$  is 0 with  $J = \text{Pitch ratio}$ .
- c) The 100% slip condition occurs.
- d) All of the above

Q5. Wake fraction is given by \_\_\_\_\_

- a.  $(V_a - V)/V$

- b.  $(V - V_a)/V_a$
- c.  $(V_a - V)/V_a$
- d.  $(V - V_a)/V$

Q6. Left hand propeller on those turn -----when producing ahead thrust

- a. viewed from aft clockwise
- b. viewed from aft anti-clockwise
- c. viewed from forward anti-clockwise
- d. none of the above

Q7. In context with power transmission, hull efficiency is given by

- a. developed power to effective power
- b. effective power/ thrust power
- c. thrust power to developed power
- d. None of the above

Q8. Area of the rudder for fast ships is given by the formula

- a.  $L * d/30$
- b.  $L * d/20$
- c.  $L * d/45$
- d.  $L * d/60$

Q9. Which of the following statements correctly describes the relation between time period of rolling ( $T_R$ ) and transverse metacentric height of ship ( $GM_T$ )

- a.  $T_R$  increases with increasing  $GM_T$
- b.  $T_R$  decreases with increasing  $GM_T$
- c.  $T_R$  decreases with decreasing  $GM_T$
- d.  $T_R$  does not depend on  $GM_T$

Q10. The significant wave height is defined as the average height of the \_\_\_\_\_.

- a. one-third highest waves
- b. one-fourth highest waves
- c. one-fifth highest waves
- d. one-tenth highest waves

### Section B

Five Questions of 02 Marks each

- Q11. What are the roles of surface tension and gravity in ocean waves?
- Q12. In a twin screw ship, the two propellers rotate in opposite directions. State the significance of the same.
- Q13. A ship of 150 m length has a speed of 12 Knot. Determine the corresponding speed for a similar 5 m model.
- Q14. State reasons for fitting the Rudder of a Ship at the Aft End
- Q15. Define "Augment of resistance".

### Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

- Q16. 6m model of a ship has a wetted surface area of  $8m^2$ . When towed at a speed of 3 knots in fresh water, the total resistance is found to be 38N. If the ship is 130m long, calculate the effective power at the corresponding speed. Take  $n=1.825$  and calculate 'r' from the formula. Assume Ship Correlation Factor as 1.15. (10 Marks)
- Q17. a. Distinguish real slip from apparent slip. (3 marks)  
b. When a propeller of 4.8 meter pitch turns at 110 rpm, the apparent slip is found to be -5% and the real slip +1.55%. If the wake speed is 25% of ship's speed, calculate the ship's speed, apparent slip and the real slip. (7 marks)
- Q18. a. With a sketch explain the momentum theory. (7 marks)  
b. Name the assumptions made on momentum theory. (3 marks)
- Q19. A ship of 12400 tonne displacement is 120 m long, 17.5 m beam and floats at a draft of 7.5 m. The propeller has a face pitch ratio of 0.75 and when turning at 100 rpm, produces a ship speed of 12 knots with a real slip of 30%. Calculate the following (a) apparent slip, (b) pitch and (c) diameter of the propeller. The wake fraction  $w$  may be found from the given expression,  
 $w=0.5C_p-0.05$  where  $C_p$  is block coefficient. (3 Marks+ 3 Marks+ 4 Marks)

Q20. a. For a container ship, the propeller open water efficiency, thrust deduction fraction and wake fraction are 0.60, 0.19 and 0.25, respectively. If the

relative rotative efficiency of the propeller is 1.0, then calculate the hull efficiency and quasi-propulsive efficiency of the propeller. (3 Marks)  
b. Describe Open Water testing of marine screw propellers. What are KT, KQ and Thrust Coefficients? (7 Marks)

- Q21. Describe the following roll reduction methods: (4 Marks)  
a) Active fin stabilizers (3 Marks)  
b) Bilge keels (3 Marks)  
c) Passive tank stabilizer (3 Marks)

Q22. A balanced rudder has an area of  $7.5 m^2$  with the centre of pressure 0.18 m from the axis and 1.3 m below the coupling. The ship is twin screw with a speed of 15 knots. Maximum angle of helm is 35 degree. Determine diameter of rudder stock assuming  $f=77.22 \times 10^6 \frac{N}{m^2}$ . (10 Marks)