

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2026
Programme Name: B Tech (ME)
Semester: VI
Subject Code: UG11T4605
Subject Name: NAVAL ARCHITECTURE II

Date: 10.06.2026

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

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

1. For a rectangular rudder behind a fin/skeg, the horizontal distance of the center of effort from the leading edge is given by: **(1 Marks)**

- a) $0.30 \times \text{Chord length}$
- b) $0.31 \times \text{Chord length}$
- c) $0.35 \times \text{Chord length}$
- d) None of the options provided

2. The ratio of thrust power to delivered power of the ship's propulsion plant is called: **(1 Marks)**

- a) Hull efficiency
- b) Propeller efficiency
- c) Quasi propulsive coefficient
- d) Relative rotative efficiency

3. It is sometimes necessary to obtain an approximation of the power of a ship without resorting to model experiments. Such an experiment is **(1 Marks)**

- a) Viscous pressure resistance method
- b) Admiralty coefficient method
- c) Relative rotating efficiency method.
- d) Thrust deduction factor method

4. Which of the following theories of propeller action assumes that the propeller is an actuator disc imparting a uniform acceleration to the fluid passing through it. **(1 Marks)**

- a) Axial Momentum theory
- b) Blade element theory
- c) Lifting line theory
- d) Circulation theory

5. Translational motion of the ship along the vertical axis: **(1 Marks)**

- a) Surging
- b) Swaying
- c) Heaving
- d) Yawing

6. The open water test indicates **(1 Marks)**

- a) ship and propeller tested together mostly in towing tank
- b) Propeller is tested till cavitation takes place
- c) Testing only the propeller without ship
- d) Testing only the ship without propeller

7. Find the motion which is not linear **(1 Marks)**

- a) Surge
- b) sway
- c) Heave
- d) Yaw

8. For the Kinematic similarity between the ship and the model requires: **(1 Marks)**

- a) ratio of any two dimensions in the model must be equal to the ratio of corresponding dimensions in the ship.
- b) ratio of velocity components in the flow around the model must be equal to the ratio of corresponding components around the ship.
- c) ratio of Force components acting at a point on the model must be equal to the ratio of corresponding force components acting at the corresponding point on the ship.
- d) All of the above.

9. An allowance made for the appendages and also the general disturbance of the water at sea compared with towing tank conditions is known as: **(1 Marks)**

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

10. For slow or medium speed ships, the Voyage consumption is directly proportional to: **(1 Marks)**

- a) V
- b) V^2
- c) V^3
- d) $V^{(1/2)}$

Section B

(All questions are compulsory)

(5 x 2 = 10 Marks)

11. What is the viscous resistance of a moving ship **(2 Marks)**
12. What is the difference between Taylor's and Froude's wake factor. **(2 Marks)**
13. What are the factors influencing the frictional resistance of a ship? **(2 Marks)**
14. What is meant by stalling of rudder? **(2 Marks)**
15. What is bollard pull condition? **(2 Marks)**

Section C

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

16. (a) List various parameters recorded during an open water test for a model propeller and draw a neat labeled diagram of typical open water characteristics curves. **(5 Marks)**

16. (b) Explain the Axial Momentum Theory of marine screw propeller. Mention the assumptions made. Write the equation for ideal efficiency of the propeller in terms of the ratio of the slip stream velocity to velocity of advance (No Derivation) and state the observations drawn. **(5 Marks)**

17. (a) Derive an expression for angle of heel due to the turning of a ship. A ship turns to port in a circle of radius 100 m at a speed of 15 knots. The GM is 0.67 m and BG is 1 m. Find the heel due to turning. **(5 marks)**

17. (b) Explain Z- manoeuvre test, in this context describe the over shoot angle. **(5 marks)**

18. (a) Explain the Reynolds laws of similarity **(4 marks)**

18. (b) A ship has an LBP of 125 m; She has frictional resistance of 129.02 kN and a residual resistance of 140.08 kN. Calculate the frictional and residuary resistances for a geometrical similar ship with LBP 130 meter.

Use Froude's law for frictional resistance $R_F = f \times A \times V^n$. Take value of f is proportional to $L^{-0.0088}$. And $n = 1.825$ **(6 marks)**

19. (a) Write short notes on

(i) Thrust deduction factor

(ii) relative rotating efficiency

(3+3 = 6 marks)

19. (b) The daily fuel consumption of a ship at 15 knots is 40 tonne. 1100 nautical miles from port, it is found that bunkers remaining 115 tons. If the ship reaches the port with 20 tonne of fuel left, then calculate the reduced speed and time taken to complete the voyage in hours. **(4 marks)**

20. A ship travelling at 15.5 knots has a propeller of 5.5 m pitch turning at 95 rev/min. The thrust of the propeller is 380 kN and the delivered power 3540 kW. If the real slip is 20% and the thrust deduction factor 0.198, calculate the Thrust Power, QPC and the wake fraction. **(10 Marks)**

21. (a) Explain different types of propeller cavitation **(5 marks)**

21. (b) In reference to laws of similarity for the propeller and model testing, the residuary resistance of one-twentieth scale model of a ship in sea water is 36 N when towed at 3 knots. Calculate the residuary resistance of the ship at its corresponding speed, and the power required to overcome the residuary resistance. **(5 marks)**

22. (a) Write the features of Trochoidal waves **(4 marks)**

22. (b) Explain the working principle of passive and active anti-roll tanks as anti-rolling device. **(6 marks)**