Indian Maritime University

(A Central Unive1rsity, Govt of India)

Sep/Oct'25 SE

Programme Name: B Tech (ME)

-Semester: VI

Subject Code: UG11T3605

Subject Name: Naval Architecture II

Date: 19.09.2025	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. 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 .....(i) Torque (ii) Thrust (iii) Resistance (iv) none of the above.
2. ____is not an appendage of ship (i) Hull (ii) bilge keel (iii) Rudder blade (iv) Shaft bossing
3. Residuary resistance comprises of ____(i) Wave making resistance (ii) Air resistance (iii) Frictional resistance (iv) all the above
4. Frictional resistance depends on_____ (i) wetted surface area (ii) projected area (iii) velocity of the fluid moving over the draft (iv) both (i) & (iii)
5. Wake fraction is given by_____ (i) (Va-V)/V(ii) (V-Va)/Va (iii) (Va-V)Va (iv) (V-Va)/V
6. When the ship starts turning by the action of rudder, centrifugal force will heel the ship in the _____direction.
7. In context with power transmission, hull efficiency is given by (i) developed power to effective power (ii) effective power/ thrust power (iii) thrust power to developed power (iv) None of the above
8. Area of the rudder for fast ships is given by the formula (i) L*d/30 (ii) L*d/60 (ii) L*d/45 (iv) L*d/60

9. Disc area ratio is (i) the ratio between developed area including the boss area to area of the circle cut by the blade tips (ii) the ratio between developed area excluding the boss area to area of the circle cut by the blade tips (iii) none of the above (iv) Insufficient data

10. Distance between two successive crests is known as (i) wave length (ii) wave height (c) trough (iv) None of the above

Section B

Five Questions of 02 Marks each

11. Name the various factors deciding the frictional resistance
12. In a twin screw ship, the two propellers rotate in opposite directions. State the significance of the same
13. A ship of 150 m length has a speed of 12 knot. Determine the corresponding speed for a similar 5 m model.
14. State reasons for fitting the Rudder of a Ship at the Aft End
15. What are the six degrees of freedom in the context of the Ship Motions in Waves?

Section C

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

16. 6m model of a ship has a wetted surface area of $8m^2$.When towed at a speed of 3knots 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 'f' from the formula. Assume Ship Correlation Factor as 1.15.
17. (i)Distinguish real slip from apparent slip. (3 marks)
(ii) When a propeller of 4.8 meter pitch turns at 110 rpm, the apparent slip is found to be --S% and the real slip +1.5S%. If the wake speed is 25% of ship's speed, calculate the ship's speed, apparent slip and the real slip. (7 marks)
18. (i) With a sketch explain the momentum theory. (7 marks)
(ii) Name the assumptions made on momentum theory. (3 marks)
19.(i) Discuss the advantages and disadvantages of twin screw system(4 marks)
(ii) Explain thrust deduction factor (6 marks)
20.(i) Compare the balanced rudder with unbalanced rudder. (4marks)
(ii) Deduce the angle of heel due to centrifugal force on rudder (6 marks)
21. The service speed of a ship is 14 knots and the rudder with an area of 13 sq. Metre, has its centre of effort 1.1 metre from the rudder stock. Calculate the torque on the stock at 10 deg. Interval of rudder angle up to 40 deg. And estimate the work done in turning the rudder from centreline up to 40 degs. Assume the rudder force parallel to the streamline is equal to 580 A v^2 Newton, (i.e. F= 580 x area of the rudder in sq.metre x square of the speed of the ship in m/s).
22. Write short notes on the following:-
a) Write short notes on Sinusoidal waves and Trochoidal waves (5marks)
b) Zigzag manoeuvring test on a ship's rudder. (5 marks)