Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – March/April 2025

Programme Name: B Tech (NAOE)

Semester: IV

Subject Code: UG12T2402

Subject Name: Hydrostatics and Stability

Date: 22.03.2025	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. What is the condition of stable equilibrium in case of a submerged body?

(a) B & G at same location (b) B is above G

(c) B is below G (d) None of the above

2. Cargo deadweight includes

(a) Fuel (b) crew (c) cargo (d) All the above

3. Shifting of cargo in bulk carrier can be avoided by providing

(a) small hatch openings (b) sloping sides
(c) hopper tanks (d) All the above

4. In the process of dry-docking a vessel, during critical period there will be

(a) Virtual loss of GM (b) Virtual gain of GM
(c) Neutral equilibrium (d) Stable equilibrium

5. What is the commonly used value of permeability for machinery compartment of cargo ships?

(a) 10% (b) 60% (c) 85% (d) 100%

6. When a floating Vessel inclines to an angle slightly greater than the angle of loll, it will _____.

(a) capsize (b) incline further
(c) flop to the other side (d) return to angle of loll

7. A vessel is in the form of a triangular prism 32 m long, 8 m wide at the top and 5 m deep. KG = 3.7 m. The initial metacentric height when the vessel is floating on an even keel at 4 m draft is:

(a) 0.68 m (b) 5.69 m (c) 0.12 m (d) None of the above

8. A mass of 6 tonne is moved transversely through a distance of 14 m on a ship of 4300 tonne displacement, when the deflection of an 11 m pendulum is found to be 120 mm. The transverse metacentre is 7.25 m above the keel. Determine the height of the centre of gravity above the keel.

(a) 4.12 m (b) 5.46 m (c) 8.64 m (d) 3.22 m

9. In probabilistic damage stability concept, if Attained index is represented as A & Required index is represented as R, select the correct condition

(a) $A<R$ (b) $A=R$ (c) $A\leq R$ (d) $A\geq R$

10. Longitudinal Centre of flotation (LCF) for oil tanker will be

(a) amidship (b) aft of amidship

(c) forward of amidship (d) None of the above

Section B

Five Questions of 02 Marks each

11. Find the angle to which a ship will heel, if the original GM is -0.01 m and the BM is 4.0 m.
12. Sketch a set of hydrostatic curves for a floating vessel.
13. Differentiate the Heel and List.
14. What is Fresh water allowance & Dock water allowance?
15. Define Permeability and give typical values of permeability for various compartments/tanks.

Section C

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

16. Describe the purpose and procedure of conduction an inclining experiment. What precautions should be taken during such an experiment? A vessel having a lightship weight of 5000 t has a metacentre at a height of 10.66m above keel. A weight of 8t is moved from extreme portside to starboard side, the ship's beam being 23.2m. This gives an angle of heel of 2 degrees. Find the height of ship's centre of gravity above keel.

17. A vessel of length between perpendiculars 150m, breadth 26.30m, draught 7.5m and a block coefficient of 0.72, the following are water line half breadths:

Station	0	1	2	3	4	5	6	7	8	9	10
Offset (m)	10.44	12.60	12.96	13.15	13.15	13.15	12.96	11.34	8.46	4.68	0

Determine the water plane area, water plane area coefficient, TPcm, longitudinal centre of floatation and transverse metacentric radius.

18. What are the intact stability criteria of ships as per SOLAS recommendations?

19. What is meant by cross curves of stability?

20. Explain added weight method of calculation of equilibrium position and stability in damaged condition of a ship.

21. A ship has a displacement of 1747 tonnes in sea water, a block coefficient of 0.537 and a mid-ship area coefficient of 0.834. The area of the immersed midship section is 30 sq.m and the ratio of beam to draught is 3.53. Find the length, beam and draught of the ship.

22. The ordinates of a curve of statical stability for a ship whose displacement is 10000 tonnes are as follows:

Angle of heel (deg)	0	10	20	30	40
GZ (m)	0	0.06	0.15	0.40	0.50

Determine the dynamical stability corresponding to 40 degrees.