Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – September/October 2024

Programme Name: B Tech (NAOE)

Semester: IV

Subject Code: UG12T2402

Subject Name: Hydrostatics & Stability

Date: 23.09.2024	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. All the transverse water-tight bulkheads will be terminating at
   a. Forecastle deck
   b. Bulkhead deck
   c. Poop deck
   d. Hatch covers
2. A ship is considered unstable when its center of gravity (G) is located
   a) Above its metacenter (M).
   b) Below its metacenter (M).
   c) Forward of its center of buoyancy (B).
   d) Aft of its center of buoyancy (B).
3. Identify the integration methods employed for determining volume/area of ship's hull form
   a. Trapezoidal rule
   b. Simpson's Rule
   c. Tchebycheff's Rule
   d. All of the above
4. What is the main factor influencing the angle of loll for an unstable ship?
   a) The size and type of the ship's rudder.
   b) The overall weight of the cargo onboard.
   c) The vertical distance between the center of gravity (G) and the metacenter (M).
   d) The wind speed and direction.
5. Tonnage is a measure of _____
   a. Weight

b. Volume
c. Density
d. Pressure

6. Which of the following factors would have the LEAST impact on a ship's initial stability?
   a) The vertical distance between the center of gravity (G) and the center of buoyancy (B).
   b) The weight distribution of cargo onboard.
   c) The ship's size and overall dimensions.
   d) The wind speed and direction (assuming calm seas).

7. According to the IMO's one-compartment standard, a ship must remain afloat and stable after flooding in:
   a) The engine room only.
   b) Any two compartments.
   c) Any specific designated compartment.
   d) One compartment anywhere along its length.

8. Which can be considered as a design solution for reducing the free surface moment of the liquid with in a tank, where the tank breadth is equal to the ship's breadth
   a. Provision of a transverse partition
   b. Provision of a twin deck
   c. Provision of a longitudinal partition
   d. None of the above

9. Probabilistic damage stability (PDS) is a relatively new approach that considers:
   a) Only the worst-case damage scenario.
   b) The probability of various damage scenarios.
   c) The impact of specific cargo types on stability.
   d) The effectiveness of life rafts in case of emergencies.

10. Margin line is an imaginary line drawn _____ mm below the bulkhead deck.
   e. 66
   f. 76
   g. 56
   h. 86

Section B

Five Questions of 02 Marks each

11. Sketch the profile plan/view of a typical merchant ship and label various components/parts.

12. Name the applications of Bonjean curves
13. What are the findings from inclining experiment?
14. List down any two intact stability criteria mandated by IMO.
15. What were the assumptions considered in lost buoyancy methods?

Section C

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

16. Define the coefficients which are used to describe the fullness of the ship's overall form.

17. Explain the effects of change of Breadth, Depth and Form on stability.

18. A ship 75 m long has half-ordinates at the load water-plane commencing from aft as follows: 0, 1, 2, 4, 5, 5, 5, 4, 3, 2 and 0 meters respectively.

    The spacing between the first three semi-ordinates and the last three semi-ordinates is half of that between the other semi-ordinates. Find the position of the Centre of Flotation relative to amidships.

19. List down the features of righting arm (GZ) and its curve.

20. Write down key points to ensure a safe operation during dry docking a vessel.

21. A box-shaped vessel has length 140 m, breadth 36 m and is on an even keel draught of 6 m in salt water. In the present condition the KG is 12.80 m.

    An empty amidships compartment extending the full breadth and depth of the vessel 60 m in length is bilged. Calculate (by lost buoyancy method):

    - the draught in the bilged condition;
    - the initial GM;
    - the GM in the bilged condition;

22. When a mass of 25 tonnes is shifted 15m transversely across the deck of a ship of 8000 tonnes displacement, it causes a deflection of 20 cm in a plumb line 4m long. If the KM = 7m, calculate the KG.