Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2025

Programme Name: B Sc (NS)

Semester: III

Subject Code: UG21T6303

Subject Name: Ship Stability - I

Date: 10th Dec 2025 Max Marks: 70

Duration: 03 Hrs Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted''
(ii) Scientific Calculator is permitted '
(iii) (Hindship Trim & Stability Particulars, permitted)

Section A

Ten MCQs 01 Mark each – Choose the correct answer as applicable.

1. IF KM > KG then 'W x GZ' is called

i) Capsizing Moment ii) Righting Lever iii) Righting Moment iv) Vertical Moment

2. RB of a box shaped vessel is 25%. Its draft is 6 m. The freeboard of the vessel is:

i) 1 m ii) 1.5 m iii) 2 m iv 2.5 m

3. For small angle of heel (< 15°) GZ can be found by formula

i) GZ = W x GM x Sinθ ii) GZ = Sinθ (GM + ½ BM $\tan^2\theta$) iii) GZ = GM + ½ BM $\tan^2\theta$ iv) GZ = GM x Sinθ

4. Centre of flotation depends on which of the following?

i) LCB of vessel ii) Water plane area of vessel iii) LCG of the vessel iv) Metacentre of the vessel

Section C

Five Questions of 10 Marks each. All are compulsory.

16 a. A vessel of 14000 t displacement is 160 m long and 20 m wide at the waterline. If she is floating in SW at a draft of 6.1 m, find her block coefficient.

16 b. A homogeneous log of rectangular cross-section is 30 cm wide and 25 cm deep. The log floats at a draft of 17 cm. Find the reserve buoyancy and the distance between the centre of buoyancy and the centre of gravity.

17. (a) Define Centre of gravity of ship and factors affecting the same (6 marks)
Ans: The centre of gravity (G or COG) of a ship is that point through which the force of gravity may be considered to act vertically downwards with a force equal to the weight of the ship.

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17. (b) A vessel of 11000 t displacement has KG 6.3 m. A jumbo derrick SI used to shift a weight of 250 t from the lower hold (KG 3 m) to the UD (KG 8.5 m). The head of the derrick is 19.5 m above the keel. Find the KG of the ship: (a) When the weight is hanging by the derrick and (b) When the shifting is over. (4 Marks)

18 a. What do you understand by Metacentre, Metacentric height & Righting lever? On a neat midship diagram of a box shaped vessel, show Metacentric height and the Righting lever. (5 marks)

18 b. A box shaped vessel of dimensions L: 150m, B: 30m, H: 18m, is floating in SW at an EK draft of 10m & is upright. Calculate her moment of statical stability at 20 degrees angle of heel using Wall sided Formula. KM= 12.5 m & KG= 8m. (5 marks)

19. A vessel of 10000 t displacement, KM 9.3 m, KG 7.3 m, has two rectangular, identical deep tanks, Port and Stbd, each 15 m long, 10 m wide and 8 m deep. The starboard deep tank is full of SW while the port deep tank is empty. Calculate the GM of the ship when one quarter of the water in the starboard deep tank is transferred to the port deep tank. (10 marks)

Q20. M.V.Hindship arrives at port of Kandla upright & with drafts F: 5.7m, A: 6.9 m, GM(Fluid) 0.77m. FSC 0.085 m. She discharges 400 t from 3 TD (Kg 10m) & loads 100 t in 5 upper Tween Deck. 86.15 t of DO was received in No. 7 DB tank (P) . Find the final GM (Fluid).

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Section C

17. a) Compare STIFF and TENDER Vessel with 6 Parameters/Points. (6 Marks)