

Indian Maritime University
(A Central University, Govt of India)

Sep/Oct'25 SE

Programme Name: BSc Nautical Science

Semester: III

Subject Code: UG21T5302

Subject Name: Ship Stability - I

Date: 20.09.2025

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.
- (iii) M. V. Hindship Trim and Stability particulars.
- (iv) Non-programmable scientific calculators are allowed.

Section A

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

1. Unit for the reserve buoyancy is -----
2. TPC of a ship in SW is 30, TPC in DW of 1.018 is ----- (28.75, 30.54, 29.47, 29.80)
3. When a ship discharges weight, The COG moves ----- (Towards, away, parallel, vertical) in relation to the discharged weight
4. When the COG is below the metacentre, the vessel is said to have
 - i) Neutral Equilibrium
 - ii) Stable Equilibrium
 - iii) Unstable equilibrium
 - iv) Longitudinal Equilibrium
5. The Water Plane Area of a ship is 785 m^2 . If C_w is 0.789 & maximum breadth of waterplane is 10 m, what is the length of the vessel?

- i) 100 m ii) 99.5 m iii) 98.0 m iv) 98.5 m

6. A line drawn perpendicular to the new buoyancy force is -----

7. A vessel of 18000 t displacement is 210 m long & 18 m wide & is floating in SW at a draft of 6 m. Find her block coefficient (C_b):

- i) 0.754 ii) 0.764 iii) 0.774 iv) 0.784

8. For a tank, FSC is 0.054m when it has diesel of RD 0.85. If it is replaced with SW, then the new FSC will be ----- (more than 0.054m, less than 0.054m, equal to 0.054m)

9. When vessel takes a sharp turning to starboard side, it ----- to port side

10. 200T weight is transferred to starboard by 15m and down by 5m, how much listing moment is created?

Section B

Five Questions of 02 Marks each

11. Give two major differences between the behavior of a stiff ship & a tender ship.

12. State the meaning of Free Surface Effect. What is its danger?

13. Derive formula for righting lever by using diagram

14. Find GM Fluid when $W=6000t$, $KM=7.4m$, $KG=6.6m$, $i=1200m^4$ is partly filled with FW.

15. For a vessel having GM fluid 1.75m, transverse shift of weight causes 0.15m COG shift. Find the list.

Section C

All five questions to be answered.

16.

(a) Calculate the distance of COF from Aft for a vessel having a water-plane consisting of a rectangular middle part $L=80\text{m}$, $B=10\text{m}$ and triangular bow 10m broad & 6m in the F & A direction. (5 marks)

(b) A ship of $10,200$ tonnes displacement, $KG\ 7.50\text{m}$, loads 1800 tonnes of cargo ($KG\ 7.0\text{m}$). A parcel of 200 t is now shifted vertically upwards such that the final KG is 7.55 m . Calculate distance shifted. (5 marks)

17. A vessel is floating in dock water of $RD\ 1.005$ with her starboard WNA mark 30 mm below, and her port WNA mark 60 mm below water line. If her summer SW draft is 8.4m , TPC is 30 and FWA is 160 mm , calculate how much cargo can be loaded to bring the vessel to her summer draft in SW.

18. (a) Explain FSE with a diagram (3 marks)

(b) A vessel has two deep tanks, P & S each 12m long, 5 m wide and 8 m deep. The port side is full of SW while starboard side is empty. $W=9840\text{ t}$, $KM=8.5\text{ m}$, $KG= 8.0\text{m}$. Find the GM Fluid if SW is transferred from port to starboard until each tank has equal quantity of ballast. (7 marks)

19. At 0800 hours on 1^{st} December, M.V.Hindship was floating in $RD\ 1.018$ with drafts F: 7.4 m & A: 9.0m . Next day same time the hydrostatic draft was 9.10 m . Calculate the amount of cargo loaded if No.4DB (C) tank which was full of SW ballast was pumped out during the day. (10 marks)

20. M.V. Hindship floats in Condition No.4, discharges the entire cargo from 1 TD and No.3 TD. The entire HFO from the settling and service tanks P & S is shifted to No. 4 DB tank centre. Find the final KG and GM Fluid.

