Indian Maritime University

(A Central University, Govt of India)

Mar/Apr'26 SE

Programme Name: B Sc (NS)

Semester: III

Subject Code: UG21T6303

Subject Name: Ship Stability I

Date: 06.03.2026	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. If the loads within a ship is shifted downwards

i) Vertical moments (About keel) increased & KG of the ship is lowered
ii) Vertical moments (About keel) decreased & KG of the ship is lowered
iii) Vertical moments (About keel) & KG of the ship remains unchanged
iv) Vertical moments (About keel) decreased & KM of the ship lowered

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 tan²θ)

iii) GZ = GM + ½ BM tan²θ

iv) GZ = GM x Sinθ

4.If final vertical moment (about keel) = 74985 t-m & final W= 11000t, KM=7.8m; Final KG & GM be:

i) 6.82 m & 0.98 m

ii) 0.98 m & 6.82 m

iii) 6.82 m & 7.80 m

iv) 6.80m & 1.0 m

5. If a ship is heeled transversely COB(B) & COG (G) of the ship.

i) Both B & G Remain vertically above each other

ii) B shifts off the vertical centreline G remains on vertical line

iii) Both B & G shifts towards heeled side

iv) Both B & G remains vertically above each other away from centre line

6. Given WPA is 2500 m2, RD 1.010, Calculate TPC'

i) 25 t ii) 25.25 t iii) 25.50 t iv) 25.625 t

7. A box Shaped vessel 105 m long, 12 m wide and 9 m high. If draft is 6m, find RB %

i) 22 % ii) 24 %. iii) 30 %. iv) 33.33 %

8. Capsizing Lever (-GZ) is formed when:

(i) The vessel is in unstable equilibrium.

(ii) The vessel has -ve Metacentric height.

(iii) The KM of vessel is less than the distance of COG from keel.

(iv) AII options are correct.

9. When vessel is pitching what will change:

i) Centre of Gravity

ii) Centre Buoyancy

iii) Metacentre

iv) None of these

10. The relationship between Cm, Cp & Cb is:

i) Cm / Cp = Cb

ii) Cm + Cp = Cb

iii) Cm x Cp = Cb

iv) Cb x Cm = Cp

Section B

Five Questions of 02 Marks each

11. With the help of a neat diagram define waterplane coefficient (Cw)'

12. Define FWA & state the formula to find FWA.

13. In a ship of 12300 t displacement, KG 10 m, 300 t of cargo was discharged from the lower hold (KG 2 m). Find the final KG.

14. Write the difference between Heel & List.

15. Define Free surface effect & its formula.

Section C

Five Questions of 10 Marks each. All are compulsory.

16. (a) A vessel displaces 16,000 t at her summer load draft in SW. If she is now floating in DW of RD 1.015 with her summer loadline on the water, calculate how much DWT is available. (3 Marks)

(b) A vessel is loading in a SW dock and is lying with her starboard Winter loadline 60 mm above and her port Winter loadline 20 mm below the surface of water. If her summer draught in SW is 7.2 m and TPC is 20, find how many tonnes of cargo the vessel can load to bring her down to her Tropical loadline in SW. (7 Marks)

17. (a) Define Centre of gravity of ship and factors affecting the same (6 marks)

(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. Sketch the midship transverse section of a box shaped vessel and Define Stable, unstable and neutral equilibrium. (10 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)

20. M.V. 'Hindship' in condition No. 7 pumps out 60 tonnes of ballast each from No. 4 DB tanks P and S. The entire diesel oil in No. 5 tank P is consumed in shifting to the dock.
Calculate her GM (Fluid) on arriving the dock where the RD of water is 1.007.
(10 Marks)

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