

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations – December 2024**  
**Programme Name : B Sc (NS)**  
**Semester : III**  
**Subject Code : UG21T5302**  
**Subject Name : Ship Stability - I**

Date: 09.12.2024	Maximum Marks: 70
Time: 3Hrs	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 (1 mark each)**

1. Given WPA is  $2000 \text{ m}^2$ , RD 1.015, Calculate TPC.  
i) 20.30 t    ii) 20.25 t    iii) 20.50 t    iv) 25.625 t
2. Displacement of vessel is 12000 t, KG 7.0m, 200 t shifted 6 m upwards. Calculate final KG.  
i) 7.1 m    ii) 6.9 m    iii) 7.033 m    iv) 7.0 m
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  $785 \text{ m}^2$ . 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) 99.0 m    iv) 98.5 m

6. M.V. Hindship is floating in SW at a hydrostatic draft of 8.0m. Her DWT available is:

- i) 2516 t    ii) 3450 t    iii) 2750 t    iv) 2982 t

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. By how much of 50 t has to be shifted transversely to upright a vessel with Initial Listing moment 450 tm

- i) 5m    ii) 7m    iii) 9m    iv) 12.5 m

10. If a vessel with displacement 14500 t, KM 8.5m & KG 7.85 m, is listed 4 deg, her listing moment will be?

- i) 659 tm    ii) 662 tm    iii) 665 tm    iv) 668 tm

### Section B

Answer all the questions. (02 Marks each)

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

12. A ship whose  $W=10,000T$ , shifts a weight vertically upward which causes GG1 0.25m. It is planned to shift a weight of 100t to compensate the GG1 shift. How far the weight should be shifted downward.

13. What do you understand by a "Displacement" curve? What is the purpose of the curve?

14. A triangular shaped vessel, apex downwards, floats in SW. Her water plane is a rectangle 90 m x 12 m. If her KB is 3 m, find her displacement.
15. Calculate hydrostatic draft of M.V.Hindship given present drafts are F: 8.0m and A: 9.2m.

### Section C

Answer all the questions (10 Marks each)

16. A barge floating in SW consists of rectangular portion of L=100m, B=20m and triangular portion in the forward with B=20m and H=20m and having same cross section from keel to deck. Its light draft is 1.5m and summer draft is 6.5m. Find the following
1. Coefficient of water plane area at 5.25m draft
  2. Find TPC in SW
  3. Find FWA at 5.0m draft
  4. Find summer displacement
  5. DWT available when floating at 4.75m draft
17. a) A vessel is lying in a river berth of RD 1.005. Her Summer freeboard is 1.8 m and present freeboard is also 1.8 m. Load displacement is 9300 t, TPC is 15 t/cm. Calculate DWT available. (5 Marks)
- b). Define Stable equilibrium and illustrate it with the help of a neat labelled diagram. (5 Marks).
18. A ship's displacement is 12,500 t, KG 8m, and KM 9.2m. There are two identical deep tanks each having dimensions L: 10 m, B: 12m, D: 12m. The Port side tank is full of SW & Starboard tank is empty. Initial List is 9 deg Port. Calculate the list after 1/3<sup>rd</sup> of the port tank is deballasted. (10 Marks)
19. At 0800 hours on 1<sup>st</sup> 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)
- Q.20 M.V.Hindship arrives at port of Chennai in condition no.5, discharges the entire cargo from 1 TD, 3 TD & 5 TD. The entire HFO from the settling and service tanks P & S & No. 5 DB (S) is shifted to no. 4 DB tank centre. Find the final GM (Fluid). (10 Marks)