

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

Date: 26.03.2024

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) all Question Compulsory.
- (ii) Scientific Calculator is permitted.
- (iii) (Hindship Trim & Stability Particulars, permitted)

**Section A**

Choose the correct answer.

1. Given FWA is 250 mm, RD 1.010, Calculate DWA.

- i) 10cm    ii) 15cm    iii) 20cm    iv) 18cm

2. Displacement of vessel is 15000 t, KG 7.0m, 200 t shifted from UD (Kg 12m) to Lower hold (Kg 4.5m). Final KG =?

- i) 7.1 m    ii) 6.966 m    iii) 7.033 m    iv) 6.9m

3. Righting Lever (GZ) is formed when:

- i) The COG of vessel is above the Metacentre.
- ii) The vessel has +ve Metacentric height
- iii) The KM of vessel is smaller than the distance of COG from keel.
- iv) The vessel has -ve Metacentric height

4. A ship of 10,000 t displacement , KG 9.0m. How many tonnes of cargo can be loaded at the LH (Kg 2m) so that final KG = 8.8m?

- i) About 295 t    ii) About 285 t    iii) About 300 t    iv) About 305 t

5. The Length of a ship at water line is 90.2m, the maximum beam is 10m, and  $C_w = 0.8$ . Find the TPC at this draft in SW

- i) 7.25 t    ii) 7.40 t    iii) 7.65 t    iv) 7.85 t

6. For a box shaped vessel TPC & displacement curves are plotted. Select the correct answer.

- i) Both the curves are inclined straight lines.  
ii) The displacement curve is a horizontal straight line whereas the TPC curve is an inclined straight line.  
iii) The displacement curve is an inclined straight line whereas the TPC curve is a horizontal straight line.  
iv) Both the curves are horizontal straight lines.

7. A ship loaded to her summer draft in RD of 1.000 has a load displacement of 16000 t. What is the DWT available?

- i) 390 t    ii) 400 t    iii) 420 t    iv) 450 t

8. By how much of 40 t has to be shifted transversely to upright a vessel with Initial Listing moment 300 tm

- i) 5m    ii) 7.5m    iii) 10m    iv) 12.5 m

9. If a vessel with displacement 12500 t, KM 8.5m & KG 8.0 m, is listed 4 deg, her listing moment will be?

- i) 433 tm    ii) 436 tm    iii) 437 tm    iv) 439 tm

10. If  $C_b$  is 0.75,  $C_w$  is 0.80 and  $C_m$  is 0.85, what is the value of the Prismatic coefficient ( $C_p$ )?

- i) 0.680    ii) 0.941    iii) 0.638    iv) 0.882

## Section B

Answer all the questions. (02 Marks each)

11. With the help of a neat diagram define midship coefficient ( $C_m$ ).
12. Define TPC and derive a formula for calculating it.
13. Briefly explain Transverse Metacentric Height.
14. What is Free Surface Effect? State the formula for FSC.
15. Calculate hydrostatic draft of M.V. Hindship given present drafts are F: 6.8m and A: 8.8m.

## Section C

Answer all the questions. (10 Marks each)

16. a. Briefly explain FWA and DWA (5 marks)  
b. A ship of 5200 tonnes displacement, KG 6.50m, loads 1800 tonnes of cargo (KG 5.0m). By how much distance & direction vertically a parcel of 200 t needs to be shifted to get final KG 6.25 m ? (5 marks)
17. a. A barge is prism shaped such that its deck and keel are parallel; its sides vertical. Its deck consists of two shapes- triangular bow of 15m each side, rectangular mid-part 100 m long and 15 m wide. The light displacement of the barge is 549.443 t & 6000 t cargo is in it. Find KB & LCB (dist of COB from aft perpendicular) when floating on an even keel in SW. (5 Marks)  
b. Define Stable equilibrium and illustrate it with the help of a neat labelled diagram. (5 Marks).
18. a. Sketch the midship transverse section of a box shaped vessel to show stable equilibrium when upright and heeled to a small angle. (5 Marks)  
b. If a ship displacing 12000t, heeled by  $6^\circ$ , has a righting lever of 0.1m, find the moment of statical stability. If the KM is 8.2m, find the KG. (5 Marks)
19. A ship of 15000t W, KM 9.0m, KG 8.7m is listed  $10^\circ$  to port. She now loads 150t of cargo 7m above the keel and 4m to starboard of the centre line. Find the final list

20. M.V.Hindship, when floating in Condition No. 2, pumps out No. 4 DB tanks (P) & (S) completely.

Calculate:

a) Final LCG (5 Marks)

b) Final GM(Fluid) (5 Marks)

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