

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2022
Programme Name: B Sc (NS)
Semester: III
Subject Code: UG21T5302
Subject Name: Ship Stability Paper-I

Date: 13.12.2022

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

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) All options are correct.

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 Reserve buoyancy of a vessel & state the formula to find RB%.
13. The displacement of a vessel is 15000 t, KM 7.5m, KG 6.9m. A rectangular tank with dimensions L 12m, B 8m is partly filled with SW. Calculate GM(F).
14. A vessel is lying in a river berth of RD 1.011. Her Summer displacement is 5000 tonnes and TPC is 12 t/cm. Calculate by how much she can decrease her statutory freeboard & still not be overloaded.
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. A ship is 110 m long, 15 m wide, and has a load draft of 5 m in SW. $C_p = 0.86$, $C_m = 0.82$. Calculate her load displacement. (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. It's 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 ship of W 15000 t, KM 7.5m, KG 6.3 m, and FSM 1500 tm, is listed 4 deg to port. A heavy lift weighting 200 t is to be discharged from No 3 LH using the ship's jumbo derrick whose head is 25 m above the keel and whose heel is on the centre line. While in No 3 LH, the COG of the weight is 3 m above the keel and 7 m to port of the centre line. Find the list at each of the following stages:
 - i) As soon as the derrick picks up the load from the LH. (3 marks)

- ii) When the derrick has swung the load 12 m to starboard of the centre line. (4 marks)
- iii) After discharging the weight. (3 marks)

19. M.V.Hindship in condition No.4, consumes the entire DO from 5 DB tank Port, Cg 7.5 m off the centre line. Calculate the resulting 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)