Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations– June 2024

Programme Name: B Sc (NS)

Semester: IV

Subject Code: UG21T5402

Subject Name: Ship Stability - II

Date: 30.05.2024	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) All questions compulsory.
(iii) Trim and stability particular of M.V. Hindship must be provided.
(iv) Non-Programmable Scientific Calculator is Permitted

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable. (10x1 = 10 Marks)

1. No trimming moment is created when the loading / unloading is taking place at ----------
2.MCTC is not directly proportional to ---------- (Displacement, Longitudinal metacentric height, inverse of Length and Inverse of draft)
3. When drawing KN curves, the assumed KG of the vessel is ---------- (Positive, Zero, Negative)
4. Body sinkage / rise is directly proportional to ---------- (Inverse of TPC, weight added, weight discharged, draft)
5. When the distance between centre of buoyancy to the metacentre increases, Righting lever ---------- (Increases, remain same, Decreases)

6. Three consecutive ordinates in a ship's water-plane, spaced 6 metres apart, are 14, 15 and 15.5 m, respectively. The area between the last two ordinates is ---------m2.

7. As per the SOLAS requirement, the residual area between the heeling arm curve and the righting arm curve up to the angle of heel of maximum difference between the ordinates of the two curves, or 40° or the angle of flooding, whichever is the least, shall in all conditions of loading be not less than ---------
8. Best remedial action in case of angle of loll is -------- (Drain out the top side tank, Fill up the bottom tank opposite of the listed side, fill up the bottom tank on the listed side)

9. Angle of loll is caused when the initial metacentric height is ----------
10. Atwood formula is used to calculate ----------

Section B

Five Questions of 02 Marks each

11. Explain the relationship between longitudinal meta centric height and change of trim.
12. Narrate what happens to the vessel hydrostatic particulars when a vessel moves from one density to another density
13. Write down 4 parameters from the statical stability curve which helps to know the stability of the vessel.

14. A ship 120 metres long at the waterline has equidistantly spaced half ordinates commencing from forward as follows:

0, 3.7, 5.9, 7.6, 7.5, 4.6 and 0.1 metres, respectively.

Find the area of the water-plane and the TPC at this draft by using simpson's 2nd rule.

15. Explain angle of loll with help of GZ diagram

Section C

Five Questions of 10 Marks each.

16. A ship 100 m long has MCT 1 cm 300 tonnes m requires 1200 tonnes of cargo to complete loading and is at present floating at drafts of 5.7 m F and 6.4m A. She loads 600 tonnes of cargo in a space whose centre of gravity is 3 m forward of amidships. The drafts are then 6.03 m F and 6.67 m A. The remainder of the cargo is to be loaded in No. 1 hold (centre of gravity 43m forward of amidships) and in No. 4 hold (centre of gravity 37 m aft of amidships). Find the amount which must be loaded in each hold to ensure that the draft aft will not exceed 6.8 metres. LCF is at amidships. (10 marks)

17. What are the intact stability characteristics of ship carrying bulk grain which need to be met throughout the voyage? Explain with diagram. (10 marks)

18. A ship's water-plane is 80 metres long. The breadths commencing from forward are as follows:

0, 3.05, 7.1, 9.4, 10.2, 10.36, 10.3, 10.0, 8.84, 5.75 and 0 m, respectively.

The space between the first three and the last three ordinates is half of that between the other ordinates. Calculate the area of the water-plane, and the position of the centre of flotation from aft. (10 marks)

19 (a). A ship is upright and is loaded with a full cargo of timber with timber on deck. During the voyage the ship develops a list, even though stores, fresh water and bunkers have been consumed evenly from each side of the centre line. Discuss the probable cause of the list and the method which should be used to bring the ship to the upright. (5 marks)

19 (b). Derive the formula for angle of loll (5 marks)

20. M.V. Hindship is at a draft of F 8.778 m, A 8.792 m, LCG 72.34 ford of AP. She discharges 206 tonnes of cargo from No. 5 LTD. Calculate the drafts F and A. (Trim and stability particular of M.V. Hindship must be provided) (10 marks)

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