

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March 2024
Programme Name: B. Sc. Nautical Science
Semester: IV
Subject Code: UG21T5402
Subject Name: Ship Stability Paper II

Date: 18.03.2024

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section
- (iii) MV Hindship stability tables to be used where necessary.
- (iv) Non programmable scientific calculators allowed.

Section A

Ten MCQs of 01 Mark each – Choose the correct answer / fill in the blanks as applicable.

1. If $LCG < LCB$, it means

- i) Vessel is trimmed by stern
- ii) Vessel is trimmed by Head
- iii) Vessel is on an Even Keel
- iv) The COF of vessel lies towards the aft.

2. When a ship is at rest in calm waters,

- a) COB and COF will be in same vertical line.
- b) COG and COB will be in same vertical line.
- c) COG and COF will be in same vertical line.
- d) None of the above.

3. This rule is also known a 1,5 -8 rule.

- i) Simpson's 1st rule
- ii) Simpson's 2nd rule
- iii) Simpson's 3rd rule
- iv) There is no such rule

4. The KG used to calculate the righting lever "GZ" in the KN formula is

- a) Fluid KG.
- b) Solid KG.

5. Fill in the blanks:

Centre of flotation is thewater plane area.

6. In Simpson's second rule, if "h" is the common interval, the constant "K" used in formula "Area = K x h x sum of products" is

- a) 3/8.
- b) 1/3.
- c) 1/12.
- d) 1/36.

7. Vessel is allowed to increase her freeboard in FW. True or False?

- a) Density of the grain loaded.
- b) Stowage factor of the grain loaded.
- c) Angle of repose of the grain loaded.
- d) None of the above

8. At angle of loll, the vessel is in

- a) Neutral equilibrium.
- b) Stable equilibrium.
- c) Unstable equilibrium.
- d) None of the above.

9. Identify the incorrect formula, where Θ is the angle of trim.

- i) $\tan\Theta = GG1/GML$
- ii) $\tan\Theta = \text{trim}/LBP$
- iii) $\tan\Theta = \text{change of draft aft}/LCF$
- iv) $\tan\Theta = \text{trimming moment}/MCTC$

10. If "L" and "B" are length and breadth of a box shaped vessel, "V" is u/w volume, the BM_T can be expressed by,

- a) $(LxB^3) / (12xV)$.
- b) $(BxL^3) / (12xV)$.
- c) $(L^3xV^3) / (12xB)$.
- d) $(VxB^3)/ (12xL)$.

Section B

Answer all Five Questions (5x2marks= 10marks)

11. What are the two main hazards associated with grain cargo?
12. If $FSC = 0.100$ m, $KG = 8.200$ m, $KN @ 30^\circ = 7.300$ m. Find $GZ @ 30^\circ$ heel.
13. What are the three methods of finding the value of Righting Lever (GZ) when the angle of heel is large? Just give the names of the methods.
14. A vessel has an initial GM of -0.300 m & BM of 5.000 m. Find the angle of loll.
15. In a profile view of a ship, show relative positions of COG & COB when a vessel is trimmed by the head.

Section C

Answer all Five Questions (5x10marks= 50 marks)

16. A ship has to load 1200 t of cargo. The drafts are 8.0m F and 9.4m A. Space is available 77 m Fwd & 58m aft of amidships. COF is 3 m aft of amidships. $MCTC = 275$ tm & $TPC = 22$ t. Final required trim is 0.5m by the stern. Calculate the distribution of cargo in the fwd and aft spaces and also state the final drafts F & A. Given LBP of vessel = 160m.
10marks
17. Half-breadths of a ship's water plane from aft, at equal intervals of 20 m are: 5, 5.88, 6.75, 6.63 & 4 m. Find area of the water plane and position of COF .
10marks
18. From the information of M.V. "Sea Breeze" plot the curve of statical stability and from the curve find the following: The range of stability, Maximum Righting Lever and the angle of heel at which it occurs & initial approximate GM . KG 8.9 m, $FSM: 3500$ tm, $W = 35000$ tonnes

Heel (θ)	KN (m)
0	0
5	0.9
10	2.0
15	3.2
20	4.4
30	6.5
45	8.75
60	9.7
75	9.4
90	8.4

10 marks

19. MV Hindship floating in water RD 1.025 at a draft of F 7.23 m, A 7.93 m, loads 940 T and sails to another port consuming 130 T of fuel and FW. Find her arrival hydrostatic draft at the second port in water RD 1.009. 10 marks

20. M.V.Hindship is at a draft of F 8.7 m, A 9.3m. She discharges 200 t of cargo from 5 LTD.

- a) Calculate initial LCG of vessel. (5 Marks)
- b) Calculate the final drafts F & A. (5 Marks)

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