

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023

Programme Name: B Sc (NS)

Semester: IV_

Subject Code: __UG 21T 5402__

Subject Name: __Ship Stability Paper - II__

Date: 26.05.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Non Programmable Scientific Calculator is permitted.
- (iii) (Hindship Trim & Stability Particulars, permitted)
- (iv) Graph paper for solving Q 18 to be provided by exam centre.

Section A

Select the most suitable correct answer – 1 mark each

1. If $LCF < LCG$ of compartment while discharging, it means
 - i) Vessel will trim by stern
 - ii) Vessel will trim by Head
 - iii) Vessel's trim will be unaffected
 - iv) The COB of vessel will move forward.
2. Simpson's multipliers for Rule 1 are?
 - i) 1,4,2
 - ii) 1,4,2,4,1
 - iii) 1,3,1
 - iv) 1,5,-8
3. This rule is also known a 5 8 -1 rule.
 - i) Simpson's 1st rule
 - ii) Simpson's 2nd rule
 - iii) Simpson's 3rd rule
 - iv) There is no such rule
4. In a box shaped vessel, if $L = 120\text{m}$, $B = 10\text{ m}$, and draft = 4m, what is the value of $BM(T)$?
 - i) 2.053m
 - ii) 2.4m
 - iii) 2.063m
 - iv) 2.083 m
5. In a box shaped vessel, if $L = 120\text{m}$, $B = 10\text{ m}$, and draft = 4m, what is the value of $BM(L)$?

- i) 200 m ii) 250 m iii) 300 m iv) 400 m

6. Fill in the blanks:

Centre of buoyancy is the underwater volume of vessel.

7. State the formula for obtaining GZ using KN value.

8. If a vessel takes to angle of loll, it means (Select the least correct answer)

- i) Vessel is only temporarily safe
- ii) Vessel is having unstable equilibrium
- iii) Immediate corrective action is required
- iv) The vessel is definitely going to capsize

9. Identify the correct formula, where θ is the angle of heel.

- i) $GZ = GM \tan \theta$
- ii) $GZ = GM \cos \theta$
- iii) $GZ = \sin \theta (GM + BM \tan^2 \theta)$
- iv) $GZ = \sin \theta (GM + 0.5 BM \tan^2 \theta)$

10. The line joining λ_0 & λ_{40} is known as:

- i) Heeling arm curve
- ii) Righting arm curve
- iii) GZ curve
- iv) None of the answers since it is a straight line.

Section B

Answer all the questions (02 Marks each)

- 11. State the effects of shifting a weight longitudinally within a ship.
- 12. What are the effects when a ship loaded to Summer draft in even keel enters a FW port from the sea
- 13. What is KN curve & how is GZ calculated using this ?
- 14. What actions should be taken if the ship develops an Angle of Loll ?
- 15. List out the hazards associated with loading grain.

Section C

Answer all the questions. (10 Marks each)

- 16. A ship of LBP 180 m, MCTC 250 tm, TPC 26t, HF 3m aft, is presently drawing 7 m forward and 10 m aft. Space is available for loading in No. 1 LH (HG 57m fwd), and No. 4 LH (HG 38m aft). Calculate:
 - i) Initial hydrostatic draft. (2 Marks)

- ii) Amount of cargo to put in each of the two spaces in order to finish at a hydrostatic draft of 9.0m trimmed 1 m by stern. (5 marks)
 iii) Final drafts F & A. (3 Marks)

17. A ship's load draft is 8.0 m. The TPC values at 1 m intervals are as follows:

Draft	2	3	4	5	6	7	8
TPC	19.68	20.91	21.53	22.04	22.45	23.06	23.37

The Underwater volume upto 2 m draft is 3400 m³ & KB 1.08m. Using Simpson's 1st rule, calculate:

- a) Load displacement (5 Marks)
 b) FWA at load draft (2 Marks)
 c) KB at load draft (3 Marks)

18. From the information of M.V. "North Star" 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.
 Given KG 9.3 m, FSM: 3000 tm, W= 30000 tonnes

Heel (θ)	KN (m)
0	0
5	0.9
10	1.92
15	3.11
20	4.25
30	6.30
45	8.44
60	9.39
75	9.29
90	8.5

(10 marks)

19. a) Your ship suddenly develops a 5 degree starboard list at sea. Enumerate the steps that will be taken by you to ascertain the cause of the list and sequence of the various corrective actions. (5 Marks)

b) How is the maximum heel due to assumed shift of grain determined as per procedures laid down in grain code? Explain with the help of a neat diagram. (5 marks)

20. a) M.V.Hindship is at a displacement of 18081 t, KG 7.50m, FSM 1897 tm. She is listed 3 degrees to starboard & is loading for maximum permissible draft in summer zone.
 Space is available 4m to starboard of centreline and 6 m port of

centreline. Find the amount to be loaded in each space, so that the ship will be upright on completion of loading. (5 Marks)

b) M.V.Hindship is floating at a draft of F: 5.7 m, A 7.8m. Calculate position of COG forward of Aft perpendicular. (5 Marks)

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Tolani