Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – March /April 2024

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4505

Subject Name: Naval Architecture 1

Date: 01.04.2024	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.

Section A

Choose the correct answer as applicable. (01 Mark each)

1. DWT stands for:
   a) Deep water Tonnage
   b) Deadweight Tonnage
   c) Dock water Tonnage
   d) None of the above

2. Relationship between Cb, Cp & Cm
   a) Cb = Cp x Cm
   b) Cb x Cp x Cm = 1
   c) Cb = Cp + Cm
   d) Cb = Cp / Cm

3. Condition of applicability for Simpson's first rule:
   a) No. of ordinates should be multiple of 3
   b) No. of common interval should be multiple of 3
   c) No. of ordinates should be odd
   d) No. of common interval should be odd

4. For which of the following curves of a ship the areas above and below the base line are equal.
   (a) Shear Force Curve
   (b) Bending Moment Curve
   (c) Load Curve
   (d) all of the above

5. Which one of the following is a part of the ship's Lightweight
   (a) Crew

(b) Machinery
(c) Cargo
(d) Fuel

6. Which one of the following set of curves helps in determining volume of displacement & LCB of the ship even when it is in trimmed condition?
   a) Bonjean Curves
   b) Cross curves of stability
   c) Hydrostatic Curves
   d) Displacement curve

7. What is The Effect on RESERVE BUOYANCY when the ship is in Fresh Water (for same Displacement)?
   a) Increases
   b) Decreases
   c) Remains same
   d) Becomes maximum

8. Point of inflection on GZ curve refers to _____.
   a) Angle of vanishing stability
   b) Angle of deck edge immersion
   c) Angle of loll
   d) Maximum righting lever

9. In the lost buoyancy method of damaged stability calculations, which one of the following will remain same as in intact condition.

(a) Metacentre
(b) Centre of floatation
(c) Centre of Buoyancy
(d) Centre of Gravity

10. When a ship travels from see water to fresh water her mean draught _____

(a) decreases
(b) increases
(c) Remains unchanged
(d) change is unpredictable

Section B

Answer the following in brief (5×2 = 10 Marks)

11. Define TPCI
12. Define block coefficient.
13. What is meant by Dynamic Stability?

14. What is meant by free surface effect?

15. Define 'longitudinal centre of buoyancy'.

Section C
Attempt any 05 questions (10 Marks each)

16.

a) Write short note on inclining experiment.

b) A ship of displacement 10,010 tonne has a container of 10 t at Kg = 7.5m. The container is shifted transversely. A pendulum of length 7.5m deflects through 13.5cm. GM of ship = 0.76m, KM = 6.7m. Find the distance through which the container shifted. Also find the new KG if the container is removed. [5+5]

17. A box- shaped vessel 45m x 10m x 6 m is floating in salt water at a draft of 4 m Forward and Aft. GM is 0.8 m. Calculate the dynamical stability to 20-degree heel. [10]

18.

The ½ girths of a ship 90 m long are as follows:
2.1, 6.6, 9.3, 10.5, 11.0, 11.0, 11.0, 9.9, 7.5, 3.9 and 0 m
The wetted surface area of the appendages is 30 m^2 and ½ % is to be added for longitudinal curvature. Calculate the total wetted surface area of the ship. [10]

19. The ½ ordinates (m) of a water plane 200 m long are as follows:

Stn.	AP	$\frac{1}{2}$	1	2	3	4	5	6	7	8	9	$9\frac{1}{2}$	10
$\frac{1}{2}$ ord.	2	3.5	7	9.5	10.5	10.8	11	10	8	6	4	2	0

Calculate: (a) Water plane area
(b) LCF from amidships,
(c) Second moment of area of water plane about a transverse axis through the centre of flotation. [10]

20. For a general cargo ship LBP = 200 m, Breadth moulded = 20 m, draft = 8 m, displacement @ 8 m draft = 14000 tonne, C_w = 0.808. Immersed mid-ship section area = 157.6 m^2.

Using a ship surgery, a midship portion 10 m long is welded into the ship. Calculate the new C_B, C_P & C_W, ship being floating on the same draught. Density of SW is 1.025 t/m^3. [10]

21. A vessel 120m long MCT 1 cm 100 tonnes-metres, TPC 25 is *drawing 6.00 m forward* and 6.60m aft. A weight of 250 tonnes is loaded 12m forward of the centre *of floatation* which is 2 m towards the stern from amidships. Calculate:
(a) the new end draft forward and
(b) the new end draft *aft.* *[5+5]*

22. Derive the Wall-sided formula where GZ is righting lever, GM is metacentric Height, BM is metacentric radius and Θ is heel angle:

$$GZ = \sin\theta(GM + \tfrac{1}{2}\, BM \tan^2\theta)$$

(10)