Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2023

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4505

Subject Name: Naval Architecture 1

Date: 14.12.2023	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. The mass of a ship without cargo, fuel, stores, water, crew etc that a ship carries is known as:
   a) Deadweight
   b) Lightweight
   c) Displacement
   d) Tonnage

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 2nd 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. DWA stands for:
   a) Deep water allowance
   b) Deadweight allowance
   c) Dock water allowance
   d) None of the above

5. The centre of pressure of a rectangular bulkhead having breadth 'b' and depth 'd', with its top edge in the waterline will be _____.

a) (d/2) below waterline
b) (d/3) below waterline
c) (2d/3) below waterline
d) (5d/4) below waterline

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. When flooding occurs in a damaged vessel, reserve buoyancy _____.
   a) shifts to the low side
   b) remains the same
   c) increases
   d) decreases

10. The existence of liquids in partially full tanks or compartments of a Ship causes a virtual rise in the height of the _____.
   a) Metacenter
   b) Center of buoyancy
   c) Center of gravity
   d) Center of flotation

Section B

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

11. Define TPCI and explain why it varies with draught.

12. Define Prismatic coefficient.

13. What is meant by Statical Stability and Dynamic Stability?

14. What is meant by free surface effect?

15. Define 'longitudinal centre of buoyancy' and 'vertical centre of buoyancy'.

Section C
Attempt any 05 questions (10 Marks each)

16.

a) State the necessary precautions to be taken while conducting 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 0.6 m. Calculate the dynamical stability to 20-degree heel. [10]

18.

a) A vessel displacing 5800 tonnes KM 7.0 m, KG 6.0 m has to load a quantity of deck cargo at Kg 11.0 m. What is the maximum quantity that she can load so that her GM is not less than 0.75 m.

b) 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. [5+5]

19. The ½ ordinates (m) of a water plane 120 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

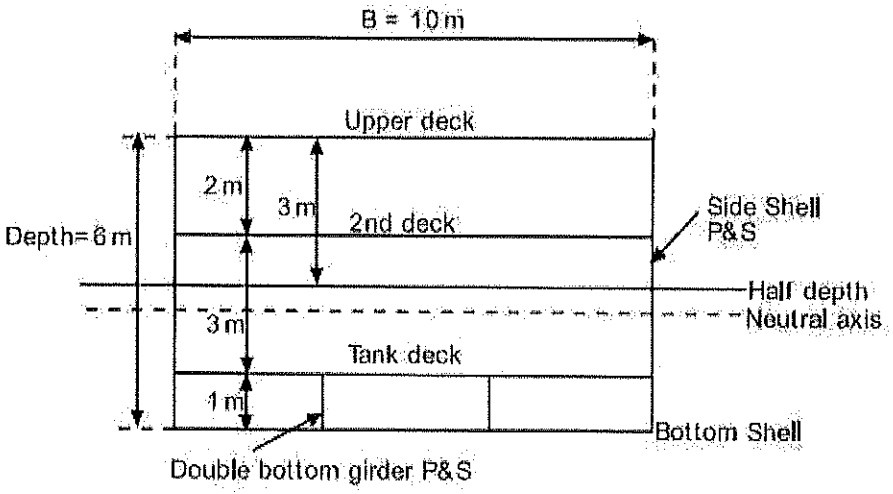
Calculate: (a) Waterplane area (b) LCF from midships, (c) Second moment of area of water plane about a transverse axis through the centre of flotation. [10]

20. For a general cargo ship LBP = 120 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. The effective part of a transverse section of a ship amidships is represented by the steel material shown in Fig below.

The beam of the ship is 10 m and the depth is 6 m. All plating is 1.5 cm thick. Find the maximum tensile and compressive stresses when the ship is subjected to a sagging moment of 6000 tonnes metres.



[10]