Indian Maritime University

(A Central Uni4versity, Govt of India)

Supplementary Examinations – March/April 2025

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4505

Subject Name: NAVAL ARCHITECTURE-I

Date: 16.04.2025	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions: All Sections (A, B & C) are to be attempted and options, if any, are specified in respective section.

Section A

Answer all ten (10) MCQs/Fill in the Blanks of 01 Mark each and choose the correct answer as applicable.

(Marks 10x1=10)

1. Curve lines under Body Plan of a ship are -----
a. Curvilinear of Buttocks
b. Curvilinear of Stations
c. Curvilinear of Water lines
d. None of the above

2. Which of the following is correct?
a) Displacement = LWT/DWT
b) Displacement=LWT+DWT
c) Displacement =LWT x Density
d) Displacement = DWT x Density

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. 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

5. 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

6. 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

7. After shifting a weight forward on a vessel, the draft at the centre of flotation will_____.

a) Change, depending on the location of the LCG
b) Decreases
c) Increases
d) Remains constant

8. According to the IMO Code of Intact Stability, what is the primary objective of intact stability requirements?

a) To ensure a ship can maintain stability under normal loading conditions
b) To ensure a ship can resist flooding and remain afloat
c) To ensure stability under various operational conditions, including rough seas
d) To prevent ships from capsizing under any circumstances

9. Which is floodable length of a ship?

a) The length between bulkheads on a ship in order to ensure that it will remain afloat if one, or more, compartments are flooded
b) The maximum length, with the centre at that point, that can be flooded without submerging the ship beyond the margin line.
c)The greatest projected moulded length of that part of the ship at or below deck
d)All of the above

10. What is longitudinal strength in ship design primarily concerned with?

a) The ability of the ship to resist rolling in waves
b) The ability of the hull girder to resist bending stresses from waves
c) The strength of the ship's cargo hold
d) The ability of the ship to remain afloat after flooding

Section B

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

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

12. What is meant by free surface effect?
13. What are KN curves. State the formula for calculating GZ from KN curves at an angle of heel θ.
14. With respect to damage stability of the ship, define Floodable length.
15. Define centre of pressure on a bulkhead.

Section C

Attempt any 05 questions (10 Marks each)

16.

a) State the necessary precautions to be taken while conducting inclining experiment. (5Marks)

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. (5Marks)

17. A ship of 8000 tonnes displacement has KM=7.5m, KG=7.0m. A double bottom tank is 12m long, 15m wide and 1m deep. The tank is divided longitudinally at the center line and both sides are full of salt water. Calculate the angle of list, if one side is pumped out until it is half empty. (10Marks)

18. A Ship's water plane is 90 m long. Half-breadths at equal intervals from forward are:

0.0,2.5,4.5,6.5,7.5,8.5,8.5,8.0,6.0 and 0 m respectively.

Find (a) area of water plane

(b) Sea water TPC

(c) Area coefficient

(Marks 4+3+3=10)

19. 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. (10Marks)

20. A box-shaped vessel 40 metres long,8 metres wide and 6 metres deep, floats in salt water on an even keel at a draft of 3 metres. GM=1metre, if an empty compartment 4 metres long and situated amidships is bilged. Find the followings:

(a)before bilging, find the KG (b) after bilging, the new draft and (c) find the new GM . (Marks-3+3+4)

21. 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. (10Marks)

22. A box-shaped barge of uniform construction is 32 m long and displaces 352 tonnes when empty, is divided by transverse bulkheads into four equal compartments. Cargo is loaded into each compartment and level stowed as follows:
No. 1 holds 192 tonnes,
No. 2 holds 224 tonnes
No. 3 holds 272 tonnes,
No. 4 holds 176 tonnes
Construct Load, shear force and bending moment diagrams.

(Marks: 4+3+3)