Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – June 2023

Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T3506

Subject Name: NAVAL ARCHITECTURE-I

Date: 22.05.2023	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)

Q1. The weight of the ship when built in shipyard including all framing, machinery, decking etc. is:

a. Deadweight Tonnage
b. Lightweight Tonnage
c. Standard Displacement Tonnage
d. All of the above

Q2. Dead weight tonnage of a ship:

(i) varies with latitude and season
(ii) is more than displacement tonnage
(iii) is the difference between displacement load and displacement light

of these statements

a. (i) and (ii) are correct
b. (ii) and (iii) are correct
c. (i) and (iii) are correct
d. Only (iii) is correct

Q3. The inclining experiment is performed by the shipyard in order to obtain the____ of the ship in the light condition.

a. KM
b. KG
c. KB
d. BM

Q4. When a weight is moved in transverse direction it may cause
a. List
b. Heel
c. Trim
d. Loll

Q5. Transverse stability calculations require the use of___:
a. hog or sag calculations or tables
b. general arrangement plans
c. hydrostatic curves
d. cross-sectional views of the vessel

Q6. GM cannot be used as an indicator of stability at all angles of inclination because:

a. M is not fixed at large angles
b. G is not fixed at large angles
c. there is no M at large angles
d. there is no G at large angles

Q7. 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

Q8. Longitudinal stability means:

a) stability about pitching axis
b) stability about yawing axis
c) stability about lateral axis
d) stability about negative yawing axis

Q9. True mean draft is

a. average draft of aft draft and forward draft.
b. draft at the centre of flotation (LCF)
c. draft at amidship
d. Laminar

Q10. When the bending moment is parabolic curve between two points, it indicates that there is:

a. No loading between the two points
b. Point loads between the two points

c. U.D.L. between the two points
d. Uniformly varying load between the two points

Section B

Answer all five (5) Questions of 02 Marks each.

(Marks 5x2=10)

Q11. Explain longitudinal prismatic coefficient.

Q12. Write uses and functions of lines plan.

Q13. What is meant by angle of loll and its corrective action?

Q14. Explain the terms 'Pure loss of stability failure'.

Q15. Explain that Lost Buoyancy Method is better approach than Added Weight Method in case of calculation of damage stability.

Section C

Answer any five (5) Questions out of Seven (7) Questions of 10 Marks each.

(Marks 5x10=50)

Q16. A ship 120 metres long at the waterline has equidistantly spaced half-ordinates commencing from forward as follows:
3.7, 5.9, 7.6, 7.5, 4.6, and 0.1 metres, respectively.
Find (a) the area of the water-plane by using Simpson's Rules only and (b) the TPC at this draft. (Marks 7+3)

Q17.a) A ship's water-plane is 72 metres long and the lengths of the half-ordinates commencing from forward are as follows: 0.2, 2.2, 4.4, 5.5, 5.8, 5.9, 5.9, 5.8, 4.8, 3.5, and 0.2 metres, respectively. The spacing between the first three and the last three half-ordinates is half of the spacing between the other half-ordinates. Find the area of the water-plane. (5 Marks)

b) A Box-shaped vessel 150m X 20m X 12 m is floating on an even keel at 5 m draft. A compartment amidships is 15 m long and contains timber of relative density 0.8 and stowage factor 1.5 m^3/tonne. Calculate the new draft if this compartment is bilged. (5 Marks)

Q18. a) Differentiate between Static and Dynamic Stability.

b) Explain Cross Curves of Stability.

c) What are the factors affecting the GZ Curve?

(Marks-4+3+3)

Q19.a) Derive the Wall-sided formula where GZ is righting lever, GM is metacentric Height, BM is metacentric radius and Θ is heel angle (5 Marks)

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

b) A box- shaped vessel 45m x 10m x 6 m is floating in salt water at a draft of 4 m F and A. GM is 0.6 m. Calculate the dynamical stability to 20-degree heel. (5Marks)

Q20. A box-shaped vessel 75 metres long X 10 metres wide X 6 metres deep is floating in salt water on an even keel at a draft of 4.5 metres. Find (a) the new draft forward and (b) the new draft aft if a forward compartment 5 metres long is bilged.(Marks-5+5)

Q21. 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. (Marks 5+5)

Q22. A box-shaped barge 40 m X 5 m has light draft of 0.8 m forward and aft in sea water. It has four identical holds, each 10 meter long. Cargoes in holds 1,2,3,4 are 198 tonnes,100 tonnes, 100 tonnes and 198 tonnes respectively. Draw load, SF and BM curves accordingly. (Marks: 3+3+4)