

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**End Semester Examinations – December 2023**  
**Programme Name: M Tech (NAOE)**  
**Semester: I**  
**Subject Code: PG11T2102**  
**Subject Name: Ship Theory**

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Date: 22-12-2023

Max Marks: 60

Duration: 03 Hrs

Pass Marks: 30

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General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective sections.

**Section A:**

10 MCQs of 01 Mark Each = 10 Marks

1. A "stiff" ship will have \_\_\_\_\_ roll period.
2. When unloading cargo from the port side lower hold the centre of gravity will move towards \_\_\_\_\_
3. If a loaded vessel passes from salt water to fresh water the buoyant force on vessel will \_\_\_\_\_
4. Net Tonnage & Gross Tonnage are measure of \_\_\_\_\_.
5. State whether the statement is true/false: "In the process of dry-docking a vessel, during critical period there will be virtual gain in GM" \_\_\_\_\_
6. Change of trim = Moment changing trim divided by \_\_\_\_\_
7. Permissible length = \_\_\_\_\_ x floodable length.
8. The loss of a ship due to flooding can be caused by
  - (a) excessive sinking
  - (b) excessive trimming
  - (c) excessive heel due to loss of GM
  - (d) All the above
9. Fire Extinguishers of rating A are designed to extinguish fires involving \_\_\_\_\_ material
10. Migration of invasive species across seas by ships can be avoided by \_\_\_\_\_

## Section B:

5 out of 7 Questions of 8 Marks Each = 40 Marks

11. Define all hull form coefficients with neat sketches. Establish relation between any three hull form coefficients.
12. The half-breadths in metres of the load water-plane of a ship 240 metres in length, numbered from aft are as follows:

stations	0	0.5	1	2	3	4	5	6	7	7.5	8
half-breadths(m)	0	9.2	12.2	15.8	16	16	15.9	13.9	9.8	6.0	0

Find the position of the centre of flotation from amidships and the value of TPC in sea water.

13. A ship has a light displacement of 2400 tonnes and a KG of 3.80 m. The following items are added to give a load departure condition:

Item (tonnes)	Height above keel (m)
Cargo (3200)	4.30
Stores (40)	6.00
Oil fuel (200)	0.75
Fresh water (60)	3.00

If the metacentre is 4.975 m above the keel in the load departure condition, find the value of GM.

14. What is the purpose of conducting inclining experiments? State four necessary conditions to be met in order to conduct this experiment. Explain the procedure.
15. The following particulars are known for a ship 120 m long, when floating in salt water at a mean draught of 7.40 m and centre of floatation is amidships.

$$KB = 3.84 \text{ m}$$

$$BM_L = 125.64 \text{ m}$$

$$KG = 6.56 \text{ m}$$

$$\text{Displacement} = 10580 \text{ tonnes}$$

What are the new draughts when a weight of 100 tonnes is moved from aft to forward through a distance of 60 m?

16. Explain the difference between 'Lost Buoyancy Method' and 'Added Weight Method' in assessing the stability of a damaged vessel.

17. What are the different types of garbage discharged to sea? What are the harmful effects to the sea due to indiscriminate garbage disposal? In this context state the IMO recommendations for garbage disposal from ships at sea and coastal waters.

**Section C:**

1 out of 3 Questions of 10 Marks Each = 10 Marks

18. A vessel having a displacement of 15000t in sea water has all oil tanks full while departing from a port. It has the centre of gravity 9.6m above keel, a metacentric height of 1.3m with a TPcm of 27.6t. There are two tanks full of fuel oil of 560t each with 0.9 density each having a length of 20m and breadth of 7.0m on the port and starboard sides. On arrival at the destination port, estimate the loss of draught and the resulting metacentric height if portside tank is empty and starboard side tank is half empty.
19. To reduce green house effect, IMO has stipulated norms of air pollution with regard to CO<sub>2</sub> emission. In this context explain what is meant by EEDI and how it controls green house effect and what are the norms fixed by IMO. How does a ship achieve EEDI in a new design?
20. A ship is to be inclined and it is known that the displacement will be about 4200 tonnes and that the GM in the inclined condition will be about 0.70 m. What total mass of ballast will be required to incline the ship if the maximum angle of heel is to be restricted to 2 degree? The beam of the ship is 14 m.