Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2022
Programme Name: M Tech (DHE)
Semester: I
Subject Code: PG12T1102
Subject Name: Safety, Pollution Control and Security

Date: 26.12.2022 Max Marks: 60

Duration: 03 Hrs Pass Marks: 30

General Instructions

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

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. The horizontal distance between the vertical lines of action of gravity and the buoyant forces is called the _____.
   a. righting arm
   b. metacentric height
   c. metacentric radius
   d. height of the center of buoyancy
2. What is the usual effect of moving weight from low in the vessel to above the main deck?
   a. The stability is increased.
   b. The draft is increased.
   c. The stability is decreased.
   d. The reserve buoyancy is decreased.
3. If the Length, Breadth, Depth and Draught of a rectangular barge is given as L, B, D and T; it KM shall be expressed as _____
   a. $(B^2/12T) + (T/2)$
   b. $(L^2/12T) + (T/2)$
   c. $(BL/12T) + (T/2)$
   d. $(B + L)^2/12D$
4. What is the commonly used value of permeability for machinery compartment of cargo ships?
   a. 10 %
   b. 60 %
   c. 85 %
   d. 100 %
5. What will the effect on GM_T, if a half filled cargo hold tank of a crude oil tanker is divided transversely?(assume the lightship weight is constant)
   a. Increases
   b. Decreases

c. Remains same
d. none of the above

6. A ship of Lpp 36.5, draft 2.5m has a steady turning circle radius of 146m at a speed of 12 knots in full loaded condition of KG 3.6m and GM 0.62m. Estimate the heel during turn.
   a. 5.76 deg
   b. 1.81 deg
   c. 3.75 deg
   d. 2.25 deg
7. The term "Floodable length" is used in the context of:
   a. Ballast tank capacity
   b. Powering
   c. Damage stability
   d. Minimum bow height
8. Name the two gases whose emission are restricted from the ship as per MARPPOL regulations.
   a. NOx, Sox
   b. N2 and H2
   c. N2 and O2
   d. None of the above
9. During end launching from a slipway, a situation can arise when the moment of upward buoyancy about the fore poppet exceeds the downward moment of the weight about the fore poppet. In such a condition, the stern lifts and there is contact with the launching ways only at the fore poppet. This condition of called_____.
   a. Pivoting
   b. Tipping
   c. Dropping
   d. Stern lift
10. The SOLAS rules are only applicable for Cargo ships having _____gross tonnage and above
    a. 200
    b. 500
    c. 1000
    d. 5000

Section B

Five Questions of 02 Marks each

11. What is a 'stiff ship' and a 'tender ship'? Give typical GM values
12. Draw the Curves of statical stability and explain the salient features
13. How is a ship's stability at large angles measured? What do you understand by an angle of loll?
14. Explain about loss of stability due to grounding
15. What are the different ballast water treatment methods

Section C

Seven Questions of 08 Marks each of which any 05 questions to be answered.

16. The cross sectional areas of a ship, 72 m LBP, 11.5 m beam and 4.3 m draught, are as follows:

Station	0	1	2	3	4	5	6	7	8	9	10
CAS (m2)	15	30	40	45	46	46	46	45	31	17	0

The waterplane at 4.3 m draught has half-breadths as follows:

Station	0	1	2	3	4	5	6	7	8	9	10
Half-breadth (m)	2.5	3.9	5	5.75	5.75	5.75	5.75	5.75	5	3.2	0

Calculate the following items:
Volume and mass displacement (sea water)
CB, CP, CW and CM
LCB (longitudinal centre of buoyancy)
LCF (longitudinal centroid of the waterplane)
IL (longitudinal second moment of WP area about axis through LCF)
IT (transverse second moment of WP area about the centreline).

17. A ship with vertical sides in way of the waterline is said to be wall sided. Show for such a vessel that for inclinations, θ, within the range of wall-sidedness:

$$GZ = \sin\theta \left[GM + \frac{1}{2} BM \tan^2\theta \right]$$

18. A ship of 10,000 tonnes displacement is listed 50 to port and trimmed 0.2 m by the head. KM = 7.5 m, KG = 6.8 m, and MCT 1 cm = 150 tonnes m. The center of flotation is amidships. No. 1 double-bottom tank is divided at the centerline, each side holds 200 tonnes of oil and the tank is full. No. 4 double-bottom tank is similarly divided, each side having a capacity of 150 tonnes, but the tank is empty. The center of gravity of No. 1 tank is 45 m forward of amidships and the center of gravity of No. 4 tank is 15 m aft of amidships. The center of gravity of all tanks is 5 m out from the centerline. It is desired to bring the ship upright and trimmed 0.3 m by the stern by transferring oil. If the free-surface effect on GM is neglected, find what transfer of oil must take place and also the final distribution of the oil.

19. A box-shaped vessel of length 65 m, beam 10 m and depth 6 m floats upright at a level keel draught of 4 min standard salt water and KG = 3.0 m. The vessel has a forepeak compartment 5 m long, 10 m wide and extending to the full depth. Find the new draughts at the perpendiculars if this compartment is bilged, assuming a permeability of 0.9.

20. Explain in short about the different annexure in MARPOL.

21.
    a. Discuss in brief about Oil tanker safety and Pollution prevention [4m]
    b. Discuss about the different types of launching [4m]

22.
    a. Sate the reasons for a Rise in G or KG on a ship [4m]
    b. When and why is an inclining experiment carried out? Discuss how it is carried out and the steps taken to ensure accurate results [4m]