

INDIAN MARITIME UNIVERSITY
(A central University, Government of India)

May/June 2018-END SEMESTER EXAMINATION

B. Tech (Marine Engineering)

Semester: V

NAVAL ARCHITECTURE – I(UG11T2506/1506)

Date: 13-07-2018

Time: 3 hrs

Maximum Marks: 100

Pass Marks : 50

Part – A
(All Questions are compulsory)

Marks: 10 x 3 = 30

1.

- (a) Define First and Second Moment of area
- (b) Define DWT, GT and NT
- (c) What is the effect of suspended mass on the center of gravity ?
Explain with a sketch
- (d) Define Dynamic Stability of a ship
- (e) What is the range of stability ? What factors is it dependent on ? Provide a suitable graph to demonstrate the quantity.
- (f) Define Heel and List. What is the difference between them ?
- (g) What is the meaning of subdivision ? Why do we do it ?
- (h) Define wetted surface area of a ship ? How is it calculated ?
- (i) What is the critical period during docking a ship ?
- (j) Describe any three coefficients of form.

Part – B
(Answer any 5 of the following 7 Questions)

Marks: 5 x 14 = 70

Use of non-programmable scientific calculator is permitted.

2.

- (a) A vessel is heeled to 20° . Assuming that she is wall-sided at the draft concerned, calculate her righting moment if the GM is 1.2 metres and the BM is 7.5 metres. The vessel's displacement is 6000 tonnes.
- (b) A vessel of triangular form length 100 m, beam 12 m, depth 6 m is displacing 3030 tonnes in water relative density 1.010. What is her reserve buoyancy?

2 x 7 = 14 Marks

3. A Vessel of length 200m has the half ordinates of waterplane values as shown, commencing at the after perpendicular (AP):

Station:	0	1	2	3	4	5	6	7	8	9	10
1/2 Ord:	0	10	13	14	14.2	14.2	14.1	14	11.5	6.2	0.2

Find:

- (a) The area of the waterplane
- (b) The position of the centroid of the waterplane relative to the after perpendicular
- (c) The second moment of area about a transverse axis through the centroid

(9 Marks)

- (d) The second moment of the area about a longitudinal axis through the centerline. (5 Marks)

Total = 14 Marks

4.

(a) A vessel has displacement 6200 tonnes, KG 8.0 m. Distribute 9108 tonnes of cargo between spaces KG 0.59 m and 11.45 m, so that the vessel completes loading with a KG of 7.57 m (6 Marks)

(b) A vessel displacement 12500 tonnes has KG 9.6 m. On completion of loading she is required to have KG of 9.5 m. 1000 tonnes is loaded at KG 5.5 m. 850 tonnes is loaded at KG 13.6 m. Find the KG at which to load a further 1600 tonnes of cargo to produce the required final KG.

(8 Marks)

5.

(a) A box shaped vessel length, 200 m, breadth 20 m and depth 10 m is loaded such that KG of the vessel is always equal to its draft. Find the maximum draft at which the vessel will be stable. (7 Marks)

(b) Just before entering drydock a ship of 5000 tonnes mass floats at draughts of 2.7 m forward and 4.2 m aft. The length between perpendiculars is 150 m and the water has a density of 1025 kg/m³. Assuming the blocks are horizontal and the hydrostatic data given are constant over the variation in draught involved, find the force on the heel of the sternframe, which is at the after-perpendicular, when the ship is just about to settle on the dock blocks, and the metacentric height at that instant.

Hydrostatic data: KG = 8.5 m, KM = 9.3 m, MCT 1 m = 105 MN, longitudinal centre of flotation (LCF) = 2.7 m aft of amidships.

(7 Marks)

6.

(a) What is admiralty and fuel coefficient ?

(2 + 2 = 4 Marks)

(b) A ship of 14900 tonne displacement has a shaft power of 4460 kW at 14.55 Knots. The shaft power is reduced to 4120 kW and the fuel consumption at the same displacement is 541 kg/h. Calculate the fuel coefficient for the ship. (10 Marks)

7. A vessel of constant rectangular cross section is 60 m long and 10 m wide. It floats at a level keel draught of 3 m and has a centre of gravity 2.5 m above the keel. Determine the fore and aft draughts if an empty, full width, fore-end compartment 8 m long is opened to the sea. For simplicity a permeability of 100 per cent is assumed. (14 Marks)

8. A vessel is about to enter a river port over a bar where the maximum depth at highwater is 9.2 m. She must have a minimum clearance of 0.5 m and is at present at draft. Forward 8.40 m, Aft 9.00 m tank. How much water must be discharged from an afterpeak tank LCG 7 m forward of AP? TPC, 25 tonne/cm; M C T C, 125 tonne m/cm; LCF, midships; length, 220 m.

(14 Marks)