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***B.Tech. Degree V Semester Examination in
Marine Engineering December 2019***

**MRE 1507 NAVAL ARCHITECTURE I
(2013 Scheme)**

Time : 3 Hours

Maximum Marks : 100

(5 × 20 = 100)

- I. (a) Draw the profile of a General Cargo ship and mark all functional areas. (8)
 (b) List out five types of commercial vessels and explain their design features. (8)
 (c) Explain features of Dredgers and Tugs and their services. (4)

OR

- II. (a) Describe design features of crude oil carriers and chemical carriers. (10)
 (b) Draw the mid-ship section of a Bulk carrier and mark the structural members. (10)

- III. (a) Explain stable, unstable and neutral equilibrium conditions of a Ship. (4)
 (b) A Ship has following data : LBp = 240m, Breadth = 32 m, Draft = 14 m in SW of 1.025 t/m³. (10)

$C_b = 0.83$ $C_{wp} = 0.93$ $C_m = 0.94$ and $GML = 310m$. Find the following:

- (i) Displaced volume (ii) TPC (iii) Displacement (iv) MCT1cm (v) C_p
 (c) If the Ship is modified by inserting a parallel mid section of 20 m length ie final length to 200m find the new values of C_b and C_p at 10m draft. (6)

OR

- IV. (a) A Ship of 14500t displacement has a water plane area of 1900 sq.meter. Ship is loaded at port to 10m draft where density is 1.002t/cub.meter and proceeds to sea where the density is 1.023t/cub.m. Find the draft at sea. (8)
 (b) Water plane area of a Ship of 140 m length and breadth of 20 m is defined as follows:- (12)

Station	AP	1	2	3	4	5	6	7	8	9	FP
Half Ord (m)	2.5	6.4	8.5	9.4	9.6	9.6	9.5	8.4	6.5	3.2	0

Calculate: (i) Area of water plane (ii) LCF (iii) TPC

- V. (a) Explain Trim, MCT1cm, TPC, and Hydrostatic draft. (6)
 (b) A Ship of 5000t displacement, 100m long floats at draft of 5.8m forward and 6.35m aft. TPC = 11.5, GML = 110m and LCF = 2.4m aft of mid-ships. Calculate (i) MCT1cm (ii) The new end drafts when 115 t onboard is moved 32m forward. (14)

OR

- VI. (a) Explain righting lever, righting moment, metacenter and metacentric height of a Ship. (8)
 (b) A Ship is having the following details: Light weight = 5000t and KG = 7m. Loading carried out as given below:
 5000 t cargo at kg = 4.5m, 700 t of fuel oil at kg = 3.5 m, 200 t stores at kg = 7m.
 At loaded condition KB = 3.4 M, KMt = 8m, KMI = 80m
 Find (i) Final KG, GMt, GML and MCT1 cm. (8)
 (ii) Trimming moment for a trim of 1.0 m. (4)

(P.T.O.)

- VII. (a) Explain the need for conducting Inclining experiment. Give a brief description about the test carried on a Ship. (7)
- (b) An inclining experiment was carried out on a Ship of 6000 t displacement. A mass of 6 t moved horizontally by 18 meters across causing a pendulum of 9 m long to deflect 100 mm. KMT value from Hydrostatic particulars is 8 m. Find: (i) Metacentric height and KG of the Ship (ii) The corrected KG if 20 t to go onboard at a KG = 8m, 3 t to come out from a KG = 12 m and there is a free surface effect of 0.01 m during the test. (8)
(5)

OR

- VIII. (a) What you meant by corresponding values? Write down the relationship for speed, wetted surface area and displacement for the Ship and Model. (8)
- (b) A rectangular Barge of 100 m x 20m is at a draft of 12 m in FW and having a speed of 8 knots. A similar Barge of 80% wetted surface area of latter to be constructed. Find out the speed and dimensions (L,B, and d) of the new barge. (6)
- (c) Voyage consumption for a Ship from Kochi to Singapore is 400 t at a speed of 16 knots. Find the speed at which it has to travel back to Kochi to reduce the consumption by 200 t. (6)
- IX. (a) Define Floodable length, Permissible length, Permeability and Factor of subdivision. (8)
- (b) A Box Barge 40m long, 8m wide is at a draft of 3m in FW and has a midship compartment of 10m long containing coal of 1.28 relative density which stows at 1.25 cub.m/t. Find (i) the permeability of this tank (4)
(ii) New draft when this tank got bilged (8)

OR

- X. 'KN' values from Cross curves of stability corresponding to displacement = 10,500 t of a Ship are given under

Angle of Inclination(degrees)	0	15	30	45	60	75	90
KN (m)	0	1.85	3.7	5.43	6.57	7.08	6.8

KG = 6.90 m, KB = 4m and KMT = 8.3 m.

- (a) (i) Find GZ values for each of above angles of inclination. (6)
- (ii) Find the value of Righting moment at angles of inclination of 45 degrees and 75 degrees and the value of Initial metacentric height. (3)
- (iii) Explain the procedure for preparing the 'Statical stability curve' from above values. (3)
- (iv) Describe the method of checking the Stability Criteria ie Point of vanishing stability, Range of stability, Dynamic stability up to 30 and 40 degrees. (5)
- (b) Further due to shifting of load upwards, KG becomes 8.5m. Find the angle of loll at this condition. (3)
