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***B.Tech. Degree V Semester Examination in  
Marine Engineering December 2017***

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

Time : 3 Hours

Maximum Marks : 100

(5 × 20 = 100)

*Note: Non programmable scientific calculator is permitted*

- I. (a) Neatly sketch the profile, plan and transverse section of a container ship and mark various parts. (10)
- (b) Describe the design features of LNG carriers and LPG carriers. (10)
- OR**
- II. (a) Explain the general classification of commercial ships. (10)
- (b) Explain the differences in the features of crude oil tankers and bulk carriers. (10)
- III. (a) With the help of neat sketches explain the lines plan drawing of a ship. What is meant by fairing of lines plan? (10)
- (b) Waterplane areas of a ship floating upright on an even keel are as follows: (10)

Draft (m)	0	1	2	3	4	5	6	7
Waterplane area (m <sup>2</sup> )	4300	4900	5300	5500	5550	5600	5600	5600

Find the volume of displacement and KB of the ship corresponding to the draft of 7 metres.

**OR**

- IV. (a) Explain various form coefficients used to describe the geometry of a ship. Write down the expressions to estimate them and define the parameters included in the expression. (10)
- (b) Half breadth values of the load waterplane of a ship, having  $L_{WL} = 36$  m, at equally spaced stations are as follows: (10)

Station number	0	1	2	3	4	5	6
Half breadth (m)	0	2.4	3.0	3.6	3.6	3.0	2.4

Calculate moment of inertia of the waterplane area about a transverse axis through the centre of floatation.

- V. (a) Explain free surface effect. How can you reduce the free surface effect? (8)
- (b) Describe the curves of statical stability of a ship. Sketch a typical statical stability curve and mark various stability information of the ship that can be obtained from such a curve. (7)
- (c) A box shaped vessel having length = 48 m, breadth = 10 m and depth = 8 m floats on an even keel at a draft of 3 m. Calculate the initial metacentric height. (5)

**OR****(P.T.O.)**

- VI. (a) What are the precautions to be taken for conducting an inclining experiment? Briefly explain the procedure for the inclining experiment. (10)
- (b) Write down the wall sided formula. Define the terms in the formula. (3)
- (c) Find the initial metacentric height of a vessel having a uniform triangular cross section (apex down) throughout its length and with the following particulars: (7)
- Length = 64 m, Breadth at the deck level = 16 m, Depth = 10 m, VCG = 5.2 m and Draft (forward and aft) = 7 m.
- VII. (a) What is meant by longitudinal centre of floatation (LCF)? How can you find its location? (6)
- (b) A box shaped vessel having length = 80 m, breadth = 12 m, and depth = 7 m is floating on an even keel at a draft of 5 m in sea water. Find the new drafts of the vessel if its aft most compartments having a length of 5 m and extending over the full breadth of vessel is bilged. Assume density of the seawater as  $1.025 \text{ t/m}^3$  and permeability of the compartment as 100%. (14)
- OR**
- VIII. (a) Explain the floodable length curves of a ship. (4)
- (b) Discuss the stability of a ship during docking. (8)
- (c) A ship having  $L_{BP}$  of 100 m is floating on an even keel at a draft of 5 m. Find the new drafts of the ship if a mass of 500 tonnes is loaded at a position 10 m aft of midship. Assume that  $LCF = 2\text{m}$  aft of midship,  $TPC = 10$  tonnes and  $MCT_{1cm} = 120$  tonne-m. (8)
- IX. (a) Explain various components of resistance of a ship. (12)
- (b) At a speed of 8 knots, the tow rope pull of a naked hull is 35.5 kN. Find the effective power of the hull at this speed. (4)
- (c) A ship of 15000 tonnes displacement has an Admiralty coefficient of 470. Find the shaft power required for the ship to achieve a speed of 14 knots. (4)
- OR**
- X. (a) Define naked hull resistance, effective power and ship correlation factor. (5)
- (b) State Froude's law of comparison. Define Froude number and Reynolds number. (5)
- (c) A ship of 15000 tonnes displacement has a fuel coefficient of 80000. Calculate the fuel consumption per day if the vessel travels at a speed of 13 knots. (4)
- (d) Briefly describe the estimation of ship's resistance using ITTC method. (6)

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