BT MRE-V(S.S)-06-23-2484 Reg. No. | | | | | | | | |

C

B.Tech. Degree V Semester Special Supplementary Examination in Marine Engineering June 2023

19-208-0507 NAVAL ARCHITECTURE-I

(2019 *Scheme*)

Time: 3 Hours Maximum Marks: 60

Course Outcome

On successful completion of the course, the students will be able to:

CO1: Understand the functions of ship and types of ships.
CO2: Explain the geometry of ship and its hydrostatic calculations.
CO3: Understand transverse stability of ships and calculate of Metacentric height.
CO4: Explain longitudinal stability of ship and do trim corrections.
CO5: Gain knowledge on resistance and power calculations of ship.

Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze, L5 – Evaluate, L6 – Create

PI – Programme Indicators

(Answer *ALL* questions) (5 × 15 = 75)

			Marks	BL	CO	PI
I.	(a)	Describe the constructional details of a container ship.	8	L2	1	1
	(b)	Explain various steps in the design of ships.	7	L2	1	1
		OR				
II.	(a)	Explain the constructional features of a bulk carrier.	8	L2	1	1
	(b)	Explain the layout of a general cargo ship.	7	L2	1	1
III.	(a)	Consider a ship floating on an even keel at 6 m draught in seawater. The areas of its waterplanes, at 1 m intervals commencing from the keel, are 6000, 6600, 7020, 7025, 7025, 7025, 7025 m^2 respectively. Find the volume of displacement and VCB of the ship corresponding to 6 m draught.	8	L3	2	1
	(b)	Draw lines plan of a cylinder, which has uniform circular cross section along its length, floating on an even keel with its axis horizontal. Assume suitable dimensions for the cylinder. The lines plan shall include atleast three stations, five waterlines and five buttocks.	7	L2	2	2
		OR				
IV.	(a)	A ship of 4200 t displacement has its CG at a location 1 m forward of midship and 4 m above the keel. 200 tonne of cargo are now discharged from a location which is 45 m forward of midship and 12 m above the keel. Calculate the new vertical and longitudinal position of CG of the ship.	8	L3	2	1
	(b)	Explain various form coefficients that are used to describe the geometry of a ship.	7	L2	2	1
V.	(a)	During the inclining experiment of a ship, a mass of 11 tonnes was shifted by a distance of 11 m in the transverse direction across the deck. This caused a deflection of 145 mm on a 5 m long pendulum. If the initial metacentric height of the ship is 0.8 m, calculate mass displacement of the ship.	8	L3	3	1
	(b)	Draw a typical statical stability curve of a stable ship having its centre of gravity at centerline. Explain various useful information, related to stability of a ship, that can be obtained from its statical stability curve.	7	L2	3	1
		OR				

			Marks	BL	CO	PI
VI.	(a)	Consider a ship having displacement of 5000 tonne in seawater. It has a rectangular tank 6 m long, 10 m wide and 5 m deep which is not subdivided. Calculate the virtual reduction in metacentric height if this tank is partially filled with a liquid of density 0.8 t/m^3. What will be the new virtual reduction in metacentric height of the ship if a longitudinal bulkhead is introduced at the centerline of the tank?	8	L3	3	1
	(b)	Derive the expression for transverse metacentric radius (BM_T) of a vessel which has uniform rectangular cross section. Draw a typical metacentric diagram of such a vessel.	7	L2	3	1
VII.	(a)	Consider a vessel of uniform rectangular cross section, having length 90 m, breadth 10 m and depth 6 m, floating in sea water of density 1.025 t/m^3 at an even keel draught of 3 m. Centre of gravity of the vessel is 3 m above the keel. Find the new draughts at forward and aft if a mass of 64 tonnes, which was already onboard the vessel, is shifted forward by a distance of 40 m.	10	L3	4	1
	(b)	Explain the change in mean draught of a ship when it moves from seawater to fresh water. Assume that the weight of the ship remains constant.	5	L3	4	1
		OR				
VIII.	(a)	Consider a vessel of uniform rectangular cross section, having length 150 m, breadth 24 m and depth 12 m, floating in sea water at an even keel draught of 5 m. Its GM is 0.9 m. It has a 20 m long midship compartment that is empty and the compartment extends over entire breadth of the vessel. Find new GM of the vessel if the midship compartment is bilged. Assume that the KG of the vessel remains unaltered.	10	L3	4	1
	(b)	Derive the expression for longitudinal metacentric radius (BM_L) of a vessel which has uniform triangular cross section with its apex down.	5	L3	4	1
IX.	(a)	Explain Froude's method for estimating the ship resistance using the model test results.	9	L1	5	1
	(b)	Consider a 64 m long ship having a speed of 24 knots. Estimate the speed of its geometrically similar model having a length of 4 m if the ship and model are run at the same (i) Froude Number (ii) Reynold's Number. Assume that both the ship and the model are run in waters of same density and viscosity.	6	L3	5	1
		OR				
X.	(a)	Explain various efficiencies associated with the conventional propulsion system of a ship. Explain propulsive coefficient and quasi-propulsive coefficient.	9	L1	5	1
	(b)	A ship of 14000 tonne displacement in seawater has an Admiralty coefficient of 450 and a fuel coefficient of 75000. Calculate the shaft power required at a speed of 16 knots and the corresponding fuel consumption per day.	6	L3	5	1

Bloom's Taxonomy Levels
L1 – 12%, L2 – 38.7%, L3 – 49.3%.

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