BT MRE-VIII(R/S)-05-25-4245 Reg. No. | | | | | | | | |

B

B.Tech. Degree VIII Semester Regular/Supplementary Examination in Marine Engineering May 2025

19-208-0804 MARINE MACHINERY SYSTEM DESIGN (ELECTIVE 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 design considerations of marine systems.
CO2: Gain knowledge regarding marine machinery component design.
CO3: Explain the design of power transmission systems and the cooling systems.
CO4: Understand the designing of Lub Oil system, Steering gear system and Air starting system.
CO5: Gain knowledge on design of fuel systems, steam and gas turbine plants, davits and firefighting systems.

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 process of casting in the manufacturing of machine parts. What are the advantages and limitations of using casting for production?	8	L4	1	1.3.1
	(b)	Compare and contrast the processes of forging and extrusion in the context of producing machine parts. Include in your answer the benefits and challenges of each process.	7	L4	1	1.3.1
		OR				
II.	(a)	What are the key considerations when designing a machine part for manufacturability? Discuss the importance of tolerances, surface finish and material selection in the design process.	10	L4	1	1.3.1
	(b)	What are the advantages and disadvantages of using welding and brazing in the assembly of machine parts?	5	L4	1	1.3.1
III.	(a)	Discuss the challenges associated with designing pistons for high-power marine diesel engines. What strategies are employed to ensure that pistons can withstand the high pressures and temperatures generated during engine operation?	10	L3	2	3.2.1
	(b)	What are the primary functions of a flywheel in a marine diesel engine? Explain how flywheel design impacts the engine's ability to maintain smooth operation and consistent speed.	5	L2	2	3.2.1
		OR				
IV.	(a)	Explain the importance of the cross-sectional shape in the design of connecting rods. How do different cross-sectional shapes, such as I-beam and H-beam designs, affect the strength-to-weight ratio and overall performance of the connecting rod?	8	L3	2	3.2.1
	(b)	What factors are considered while designing an engine room crane on board the ship? What safeties are incorporated in its design?	7	L3	2	3.2.1

(P.T.O.)

			Marks	BL	CO	PI
V.	(a)	What are the common causes of shafting system failures in ships and how can they be prevented through design, operation and maintenance practices?	8	L4	3	3.2.3
	(b)	Describe with the aid of sketches, the central cooling water system of a modern Ship and explain how the temperatures are maintained at optimum levels.	7	L2	3	1.3.1
		OR				
VI.	(a)	What are the common lubrication methods for thrust bearings in marine applications? Discuss the importance of lubrication in preventing wear and ensuring the smooth operation of the bearing.	5	L3	3	1.4.1
	(b)	Explain the design considerations for selecting and sizing heat exchangers in a marine engine cooling water system. How do factors like heat load, pressure drop and seawater quality influence the design?	5	L3	3	3.2.1
	(c)	What are the common materials used for cooling water system components and why are they chosen? Discuss considerations such as corrosion resistance, strength and thermal conductivity.	5	L3	3	3.3.1
VII.	(a)	What are the primary functions of a lubricating oil system in a marine engine? Discuss the importance of filter selection in maintaining oil cleanliness and engine health.	10	L2	4	1.4.1
	(b)	What design features are incorporated to minimize the risk of sludge buildup and ensure continuous, reliable operation of the purifier?	5	L4	4	3.2.1
		OR				
VIII.	(a)	How does the Safe-Matic system ensure redundancy and fail-safe operation in the event of a primary steering gear failure?	5	L3	4	1.3.1
	(b)	What are the primary design considerations for a pneumatic starting system for ship diesel engines to ensure reliable operation?	5	L3	4	3.2.1
	(c)	What are the main factors influencing the size and shape of a ship's rudder during the design process?	5	L3	4	3.2.1
IX.	(a)	Explain the fuel injection system of a modern two stroke engine and enumerate its advantages.	8	L2	5	1.3.1
	(b)	What safeties are provided on the CO2 fire fighting system of a cargo ship. Calculate the number of CO2 cylinders required for a engine room of 6000 m^3 gross volume.	7	L3	5	3.2.1
		OR				
X.		Write short notes on-				
		(i) Use of FEA for design of engine parts	5	L2	5	5.1.1
		(ii) Emergency fire pump design requirements	5	L3	5	3.2.1
		(iii) Design of steam Turbines	5	L2	5	3.2.1

Blooms's Taxonomy Level
L2 – 26.6%, L3 – 44.7%, L4 – 28.7%.

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