Q. Code: 253745

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATION, MAY 2023

Second Semester

MR18201 – MARINE ENGINEERING THERMODYNAMICS

(Marine Engineering)

(Regulation 2018A)

(Use of Steam Tables and Mollier Diagram may be permitted)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 On completion of this course, students are expected to apply first law of thermodynamics to engineering applications

CO 2 On completion of this course, students are expected to apply second law of thermodynamics to engineering applications.

CO 3 On completion of this course, students are expected to understand properties of steam and apply it to Rankine cycle.

CO 4 On completion of this course, students are expected to understand air standard cycles and analyse them.

CO 5 On completion of this course, students are expected to understand thermodynamic relations and combustion of fuels.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What do you understand by the term "equilibrium process"?	**1**	**2**
2.	What is meant by intensive property? Give examples.	**1**	**1**
3.	Mention the processes involved in Carnot cycle.	**2**	**2**
4.	State the Kelvin plank statement of second law of thermodynamics.	**2**	**1**
5.	What are the advantages of reheat Rankine cycle?	**3**	**2**
6.	How quality of steam is determined?	**3**	**2**
7.	Differentiate between Otto and Diesel cycles.	**4**	**2**
8.	How heat addition takes place in dual cycle?	**4**	**2**
9.	What is the role of excess air in combustion of fuels?	**5**	**1**
10.	What is meant by higher calorific value?	**5**	**1**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11(a)	Air at 1.02 bar, 22 °C, initially occupying a cylinder volume of 0.015 m^3, is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar. Calculate the final temperature, final volume and the workdone.	**(14)**	**1**	**3**
	OR			
11(b)	Steam at 6.87 bar, 205 °C, enters in an insulated nozzle with a velocity of 50 m/s. It leaves at a pressure of 1.37 bar and at a velocity of 500 m/s. Determine the final enthalpy of steam.	**(14)**	**1**	**3**

12(a)	A domestic food refrigerator maintains a temperature of -12 °C. The ambient temperature is 35 °C. If heat leaks into the refrigerator at the continuous rate of 2 kJ/s, determine the least power necessary to pump this heat out continuously.	**(14)**	**2**	**3**
	OR			
12(b)	Explain working of the Carnot cycle with neat sketches and property diagrams. Also state the assumptions made.	**(14)**	**2**	**3**
13(a)	Analyze the Rankine cycle with appropriate diagrams and discuss the methods of improving efficiency of the cycle.	**(14)**	**3**	**4**
	OR			
13(b)	A simple Rankine cycle works between pressures 28 bar and 0.06 bar. The initial condition of the steam is dry saturated. Estimate the cycle efficiency, work ratio and specific steam consumption.	**(14)**	**3**	**4**
14(a)	Explain working of the Diesel cycle with P-v and T-s diagrams and derive expressions for its efficiency with usual notations.	**(14)**	**4**	**3**
	OR			
14(b)	Explain working of the Otto cycle with P-v and T-s diagrams and derive expressions for its efficiency with usual notations.	**(14)**	**4**	**3**
15(a)	Derive Maxwell thermodynamic relations with usual notations.	**(14)**	**5**	**3**
	OR			
15(b)	Explain the construction and working of Orsat apparatus with neat sketches.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16	Analyze the Regenerative Rankine cycle and explain how it improves cycle efficiency.	**(10)**	**3**	**5**