Code No.: ME505PC	R20	H.T.No.			8	R					

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply)–June - 2025
THERMAL ENGINEERING-II
(MECH)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks.

PART-A **(20 Marks)**

1.	a)	Define concept of mean temperature heat addition.	[2M]
	b)	Classify the boilers.	[2M]
	c)	Distinguish between convergent and divergent nozzle.	[2M]
	d)	List out the assumptions made in thermodynamic analysis of steam nozzle.	[2M]
	e)	Draw velocity diagram for an impulse turbine.	[2M]
	f)	State the importance of compounding of steam turbines.	[2M]
	g)	What are the various functions of steam condenser?	[2M]
	h)	Illustrate the various methods to improve the efficiency in gas turbines.	[2M]
	i)	Define propulsive efficiency and thrust efficiency of jet engines.	[2M]
	j)	Name the thrust augmentation methods used in jet propulsion.	[2M]

PART-B **(50 Marks)**

2.	a)	Briefly discuss the limitations of the Carnot vapour power cycle in practical use.	[4 M]
	b)	A steam power plant works between pressures of 40 bar and 0.05 bar. If the steam supplied is dry saturated and the cycle of operation is Rankine cycle, find (i) Cycle-efficiency (ii) Specific steam consumption.	[6 M]

OR

3.	a)	What are the features of High-Pressure Boilers?	[4M]
	b)	What are the different Mountings and Accessories used in Boilers explain any two in each?	[6 M]

4.		Dry saturated steam enters a nozzle at pressure of 10 bar and with an initial velocity of 90 m/sec. The outlet pressure is 6 bar and outlet velocity is 435 m/sec. The heat loss from the nozzle is 6.3 kJ per kg of steam flow. Calculate the dryness fraction and the area at the exit, if the area at the inlet is 12.56 cm^2.	[10M]

OR

5.	a)	How are nozzles classified based on Mach number of the flow passing through?	[4 M]
	b)	Derive the expression for the critical pressure ratio in a steam nozzle.	[6 M]

6.		Derive an expression for optimum stage efficiency of a reaction turbine.	[10M]

OR

7.		In a steam turbine, the steam expands from an inlet condition of 9 bar and 325^0 C with an isentropic efficiency of 90%. The nozzle is inclined at an angle of 20^0 and operates with optimum blade speed ratio. If the blades are symmetrical. Calculate the blade angles and power output from the turbine if the mass flow rate is 0.5 kg /s.	[10M]

8.a) Illustrate the effects of air leakage in the condenser. [4 M]
b) Describe the working principle of Edward air pump with neat sketch. [6 M]

OR

9.a) Enumerate the advantages and limitations of gas turbines over steam turbines. [4 M]
b) The minimum and maximum temperature limits in a gas turbine plant are 288 K and 1100 K. The pressure limits are 1 bar and 8 bar. Determine the thermal efficiency and work ratio. [6 M]

10. A turbojet engine travels at 216 m/s in air at 0.78 bar and -7.2^0 C. Air first enters into diffuser in which it is brought to rest relative to the unit and it is then compressed in a compressor through a pressure ratio of 5.8 and fed to a turbine 1110^0 C. The gases expand through the turbine and then through the nozzle to atmospheric pressure (i.e., 0.78 bar) the efficiencies of diffuser, nozzle and compressor are each 90%. The efficiency of turbine is 80% pressure drop in the combustion chamber is 0.168 bar determine: i) A/F ratio ii) Specific thrust of the unit iii) Total thrust, if the inlet cross section of diffuser is 0.12 m^2. Assume calorific value of fuel as 44150 kJ/kg of fuel. [10M]

OR

11.a) Derive the equation for the thrust and specific impulse of a rocket engine. [5 M]
b) Classify the rocket engines based on the propellant used and explain the working principle of liquid propellant rocket engine. [5 M]

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