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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply)–December - 2024
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)	What is regeneration?	[2M]
b)	Define equivalent evaporation.	[2M]
c)	What do you mean by metastable flow of a steam nozzle?	[2M]
d)	Define nozzle efficiency.	[2M]
e)	Discuss the effect of blade friction in steam turbines.	[2M]
f)	Illustrate the advantages of the reaction turbine over impulse turbine.	[2M]
g)	How steam condensers improve the thermal efficiency of a steam power plant.	[2M]
h)	What are the different methods used to improve the thermal efficiency of a gas turbine plant?	[2M]
i)	Illustrate the thrust augmentation methods used in jet propulsion.	[2M]
j)	Name some solid propellants used in rocket engines.	[2M]

PART-B **(50 Marks)**

2.a.	What are the essentials of a good boiler.	[3M]
b.	Describe the working of a Babcock and Wilcox boiler.	[7M]
	OR	
3.	Derive the condition for the maximum discharge through a chimney.	[10M]
4.	Deduce the expressions for the maximum discharge through a nozzle from the discharge equation.	[10M]
	OR	
5.	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]
6.a.	Derive the expression for the diagram efficiency of a impulse steam turbine.	[7M]
b.	Distinguish between impulse turbine and reaction turbine.	[3M]
	OR	
7.	In a reaction turbine the diameter of the rotor is 2 m and its speed is 800 rpm. The steam consumption amounts to 870 kg/min. The height of blade at a particular stage is 15 cm. The exit angle of the nozzle and the moving blades is 25^0. The pressure at this stage is 0.3 bar and steam is 0.98 dry. Estimate the power developed and heat drop in kJ/s.	[10M]
8.	What are the different types of condensers and describe the working of any two condensers.	[10M]
	OR	
9.	A Gas turbine plant has an overall pressure ratio of 5 and a maximum temperature of 550^0C. The turbine drives the compressor and an electric alternator, with transmission efficiency of 97%. The ambient temperature is 20^0C and isentropic efficiency of the compressor and turbine are 80 and 83%, respectively. Calculate the power input to alternator for an air flow rate of 15 kg/s. Also, calculate the thermal efficiency and work ratio.	[10M]

10. A turbo jet has a speed of 750 km/h while flying at an altitude of 10,000 m. The propulsive efficiency of jet is 50% and overall efficiency of the turbine plant is 16%. The density of air at 10,000 m altitude id 0.173 kg/m^3. The drag on the plant is 6,250 N. The calorific value of the fuel is 4,800 kJ/kg calculate i) Absolute velocity of the jet ii) Volume of air compressed per minute iii) Diameter of the jet iv) Power output of the unit in kW. [10M]

OR

11.a. Differentiate between jet engines and rocket engines. [4M]

b. Classify the rocket engines and describe the working principle of liquid propellant rocket engine. [6M]

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