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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply) - May- 2023
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)	Draw P-V and T-s diagram of reheat cycle.	[2M]
b)	Illustrate the functions of the boiler mountings.	[2M]
c)	what is the effect of friction on flow through a steam nozzle?	[2M]
d)	Define critical pressure ratio in a steam nozzle.	[2M]
e)	Write the expression for getting maximum blade efficiency in single stage reaction turbine.	[2M]
f)	Distinguish between impulse and reaction turbine.	[2M]
g)	What are the requirements of steam condensing plant?	[2M]
h)	Write a brief note on necessity of inter cooling in a gas turbine.	[2M]
i)	List out the different types of solid propellants used in rocket engines.	[2M]
j)	Define thrust augmentation.	[2M]

PART-B **(50 Marks)**

2.a)	Why Rankine cycle is preferred over Carnot vapor cycle in steam power generation applications.	[4 M]
b)	A steam power plant operates an ideal Rankine cycle. The steam enters the turbine at 3 MPa, 350^0 C and is condensed in the condenser at a pressure is 75 kPa. Find the thermal efficiency and work ratio of the cycle.	[6 M]
	OR	
3.a)	Distinguish between low pressure boilers and high pressure boilers.	[4 M]
b)	Describe the working of La Mont boiler with neat sketch.	[6 M]
4.a)	Explain the effect of friction in a nozzle flow with the help of h-s diagram.	[4 M]
b)	Derive the expression for the mass of steam flow through the nozzle.	[6 M]
	OR	
5.	Steam having pressure of 10.5 bar and 0.95 dryness is expanded through a convergent divergent nozzle and the pressure of steam leaving the nozzle is 0.85 bar. Find the velocity at the throat for maximum discharge conditions. Index of expansion may be assumed as 1.135 bar. Calculate mass flow rate of steam through the nozzle.	[10M]
6.	Derive the expression for the diagram efficiency of a impulse steam turbine.	[10M]
	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 the 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.a) Compare and contrast jet and surface condensers. [4 M]

b) Obtain the equation for the condenser efficiency and vacuum efficiency. [6 M]

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 the 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 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 is 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) Distinguish between jet engines and rocket engines. [4 M]

b) Derive the equations for thrust and propulsive efficiency of rocket engines. [6 M]

****