Question Paper Code: R18A31ME02

R18

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech I Semester Regular/Supplementary Examinations, Dec–2023/Jan-2024

THERMAL ENGINEERING – II

(MECHANICAL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Draw the different processes of Rankine cycle on a T-S diagram. Mention the different operations of Rankine cycle.	CO1	L2	2M
2.	What is reheating? Write the advantages of reheating Rankine cycle.	CO1	L1	3M
3.	What are the boiler mountings and accessories? Write the basic difference between them.	CO2	L1	2M
4.	Explain `Boiler Draught`?	CO2	L2	3M
5.	What is the effect of friction on the flow through a steam nozzle?	CO3	L1	2M
6.	Briefly state the effects of air leakage on the performance of a condenser.	CO3	L2	3M
7.	Give the classifications of steam turbines	CO4	L1	2M
8.	What is degree of reaction and explain?	CO4	L1	3M
9.	Define Thrust and Propulsive efficiency.	CO5	L1	2M
10.	What are the advantages and disadvantages of Gas Turbines over Steam Turbines	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	In a Rankine cycle, the steam at inlet to turbine is saturated at pressure of 30 bar and exhaust pressure is 0.25 bar. Determine i) The pump work ii) Turbine work iii) Rankine efficiency iv) Condenser heat flow v) dryness at the end of expansion. Assume flow rate of 10 kg/s.	CO1	L3	10M
	OR			
B)	The steam is supplied to a steam turbine at a pressure of 32 bar and a temperature 410°C. The steam then expands is entropically to a pressure of 0.08bar. Find the dryness fraction of steam at the end of expansion and thermal efficiency of the cycle. If the steam is reheated at 5.5 bar to a temperature of 395°C and then expands is entropically to 0.08 bar, what will be the dryness fraction at the end of final expansion and the thermal efficiency of the cycle?	CO1	L3	10M
12. A)	Explain the construction and working of a "Babcock and Wilcox" boiler.	CO2	L2	10M
	OR			
B)	Define chimney efficiency and derive an expression for the same.	CO2	L2	10M
13. A)	Steam at a pressure of 10bar and 0.9 dry discharges through a nozzle having throat area of 450mm^2. If the back pressure is 1bar. Find final velocity of the steam and cross-sectional area of the nozzle at exit for maximum discharge.	CO3	L3	10M

	OR			
	B) Describe with neat sketches the different forms of a surface condenser used in steam power plants. List the factors which are responsible for the loss of efficiency in a surface condenser.	CO3	L3	10M
14. A)	Steam enters an impulse wheel having a nozzle angle 20^0 at a velocity of 450 m/sec. The exit angle of moving blade is 20^0 and the relative velocity of steam may be assumed to remain constant over the moving blades. If the blade speed is 180m/sec; Calculate. i) Blade angle at inlet, ii) Work done per kg of steam, iii) Power developed if rate of steam flow is 1.6 kg/sec.	CO4	L3	10M
	OR			
	B) Derive the expression for maximum efficiency of reaction turbine.	CO4	L3	10M
15. A)	A gas turbine unit receives air at 1 bar and 300 K and compresses it adiabatically to 6.2 bar. The compressor efficiency is 88%. The fuel has a heating value of 44186 KJ/kg and the fuel air ratio is 0.017 KJ/kg of air. The turbine efficiency is 90 %. Calculate the work of turbine and compressor per kg of air compressed and thermal efficiency. Take Cp=1.005 KJ/kg K, γ=1.4 for the compression process, Cp=1.147 KJ/kg K, γ=1.33 for the expansion process.	CO5	L3	10M
	OR			
	B) Describe the construction and working of a turbo-prop engine.	CO5	L2	10M

Note: Steam Table and Mollier Charts are allowed.