Question Paper Code: R18A21ME01/R15A21ME01

R18/R15

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech. I Semester Supplementary Examinations, June/July – 2024

THERMODYNAMICS

(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.	What are the causes of irreversibility?	CO1	L1	2M
2.	State zeroth law of thermodynamics.	CO1	L1	3M
3.	What is the qualitative difference between first and second law of thermodynamics?	CO2	L1	2M
4.	Write briefly about reversible and irreversible process.	CO2	L1	3M
5.	Explain dryness fraction.	CO3	L2	2M
6.	Explain the significance of mollier charts.	CO3	L2	3M
7.	What is Gravimetric analysis.	CO4	L1	2M
8.	What is the difference between ideal and real gas?	CO4	L1	3M
9.	Write the equation for thermal efficiency of Diesel cycle.	CO5	L2	2M
10.	Sketch P-V diagram for Otto Cycle.	CO5	L2	3M

Section B (Essay Questions)

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

11. A)	Air at an initial state of 300 K, 150 kPa and 0.2 m3 is compressed slowly in an isothermal process to a final pressure of 800 kPa. Show the process on p-V diagram and determine the work done during this process.	CO1	L3	10M
	OR			
B)	Write short notes on i) Work and Heat ii) Path and Point functions	CO1	L2	10M
12. A)	Explain Carnot Cycle in detail with the help of P-v T-s diagrams. And derive an expression for thermal efficiency.	CO2	L3	10M
	OR			
B)	A heat engine receives a heat transfer rate of 1 MW at a high temperature of 550° C and rejects energy to the ambient surroundings at 300 K. Work is produced at a rate of 450 kW. How much energy is discarded to the ambient surroundings and what is the engine efficiency? Compare both of these to a Carnot heat engine operating between the same two reservoirs.	CO2	L3	10M
13. A)	Draw and explain P-v-T surface and projections for a substance that contracts on freezing i) Three-dimensional view ii) p-v Diagram iii) P-T diagram	CO3	L3	10M
	OR			
B)	Explain the following i) Clausius Theorem and ii) Mollier Chart	CO3	L3	10M
14. A)	Analyze the intermolecular Attraction and size of molecule to determine the constants through derivation of the Vander Waal's equation of state.	CO4	L3	10M
	OR			

B)	Air enters an evaporative cooler at 1 atm, 36°C, and 20 percent relative humidity at a rate of 4 m^3/min, and it leaves with a relative humidity of 90 percent. Determine (i) the exit temperature of the air and (ii) the required rate of water supply to the evaporative cooler.	CO4	L3	10M
15. A)	Discuss briefly different processes involved in Otto cycle and show them in p-v and T-s diagrams. Derive expression for thermal efficiency of Otto cycle.	CO5	L3	10M
	OR			
B)	An engine working on the Otto cycle is supplied with air at 0.1 MPa, 35^0 C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency and the mean effective pressure. (Take C_p for air as 1.005, C_v as 0.718 and R as 0.287 kJ/kg K)	CO5	L3	10M