Q.P.Code: 20ME0303	R20	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Regular & Supplementary Examinations August-2023

BASIC THERMODYNAMICS
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

(Answer all Five Units **5 x 12** = **60** Marks)

UNIT-I

1	a	Define the following terms i) System ii) Boundary iii) Surroundings	CO1	L1	6M
	b	What is quasi static process? Explain in detail.	CO1	L2	6M
		OR			
2		Classify different work transfers. Explain them.	CO1	L2	12M

UNIT-II

3	a	10 kg of fluid per minute goes through a reversible steady flow process. The properties of fluid at the inlet are: P_1 = 1.5 bar, $\rho 1$ = 26 kg/m^3 ,C1= 110 m/s and u1 = 910 kJ/kg and at the exit are P_2 = 5.5 bar, ρ_2 = 5.5 kg/m^3 , C2= 190 m/s and u_2 = 710 kJ/kg. During the passage, the fluid rejects 55 kJ/s and rises through 55 meters. Determine : (i) The change in enthalpy (Δ h) ; (ii) Work done during the process (W).	CO2	L4	6M
	b	In an air motor cylinder the compressed air has an internal energy of 450kJ/kg at the beginning of the expansion and an internal energy of 220kJ/kg after expansion. If the work done by the air during the expansion is 120kJ/kg, calculate the heat flow to and from the cylinder.	CO2	L4	6M
		OR			
4		Derive the reversible adiabatic process law $pv^{\gamma} = c$.	CO2	L3	12M

UNIT-III

5		Derive the equation for computing the entropy change of an Ideal gas.	CO3	L3	12M
		OR			
6	a	State and Explain Dalton law of partial pressure.	CO3	L2	6M
	b	How the partial pressure in gas mixture related to mole fraction	CO3	L2	6M

UNIT-IV

7		Develop the expression for air standard efficiency, work done of an Otto cycle.	CO4	L6	12M
		OR			
8		Derive an expression for air standard efficiency of dual combination cycle.	CO4	L6	12M

UNIT-V

9		A simple Rankine cycle works between pressures 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption.	CO5	L3	12M
		OR			
10		A steam power plant operates on a theoretical reheat cycle. Steam from boiler at 150 bar, 550°C expands through the high pressure turbine. It is reheated at a constant pressure of 40 bar to 550°C and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-s and h-s diagrams. Find : (i) Quality of steam at turbine exhaust ; (ii) Cycle efficiency ; (iii) Steam rate in kg/kWh.	CO5	L3	12M

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