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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Regular & Supplementary Examinations May 2019

ENGINEERING THERMODYNAMICS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1	**a**	Discuss the macroscopic and microscopic point of view of thermodynamics?	6M
	b	What is the difference between a closed system and an open system?	6M
		OR	
2	**a**	Define and explain Zeroth Law of Thermodynamics".	6M
	b	What do you understand by path function and point function? What are the exact and inexact differentials?	6M

UNIT-II

3	**a**	Derive Steady Flow Energy Equation for Turbine	4M
	b	A turbine operates under steady flow conditions, receiving the steam having an enthalpy of 2786 KJ/Kg and leaves with an enthalpy of 2513 KJ/Kg. Heat is lost to the surroundings at the rate of 5.30 KJ/sec. If the rate of steam flows though the turbine is 0.40Kg/sec. Find the power output of the turbine.	8M
		OR	
4	**a**	Derive Steady Flow Energy Equation for Nozzle?	6M
	b	The enthalpy of a steam 3015.6 KJ/Kg enters a nozzle and leaves with an enthalpy of 2819.8 KJ/Kg. Calculate the velocity of steam at the exit, if the velocity of steam at the entry is 50 m/sec.	6M

UNIT-III

5	**a**	What are the limitations of the First law of Thermodynamics?	4M
	b	A reversible power cycle is used to drive a reversible heat pump cycle. The power cycle takes in Q1 heat units at T1 and rejects Q2 at T2. The heat pump abstracts Q4 from the sink at T4 and discharges Q3 at T3. Develop an expression for the ratio Q4/Q1 in terms of the four temperatures.	8M
		OR	
6	**a**	A block of iron weighing 100 kg an having a temperature of 100 0C is immersed in 50 kg of water at a temperature of 20 0C. What will be the change of entropy of the combined system of iron and water? Specify heats of iron and water are 0.45 and 4.18kJ/kg K respectively.	6M
	b	Calculate the decrease in exergy when 25 kg of water at 95 0C mix with 35 kg of water at 35 0C, the pressure being taken as constant and temperature of the surrounding being 15 0C (cp of water = 4.2 kJ/kg K).	6M

UNIT-IV

7	**a**	What is the gas equation of ideal gas?	5M
	b	A mass of 0.25 kg of an ideal gas has a pressure of 300 kpa, the temperature of 800C an volume of 0.07 m3.The gas undergoes an irreversible adiabatic process to final pressure kpa and final volume of 0.1 m3,during which the work done on the gas is 25 kj. Evaluat Cv of the gas and increase in the entropy of the gas.	7M
		OR	

8 **a** A mass of an ideal gas exists initially at a pressure of 200 kPa, temperature 300 K, and specific volume 0.5 m3 /kg. The value of r is 1.4.
(a) Determine the specific heats of the gas.
(b) What is the change in entropy when the gas is expanded to pressure 100 kPa according to the law pv1.3 = const? 8M
(c) What will be the entropy change if the path is pv1.5 = const?
(by the application of a cooling jacket during the process)
(d) What is the inference you can draw from this example?

b What is Avogadro's law? 4M

UNIT-V

9 **a** Derive an expression for the thermal efficiency and mean effective pressure of an Otto cycle by drawing PV and TS diagrams? 7M

b What is Joule- Thomson coefficient? Why he is zero for ideal gas? 5M

OR

10 **a** An Air Standard Dual cycle has a compression ratio of 16, and the compression begins at 1 bar, 500C.The maximum pressure is 70 bar, the heat transferred to air at constant pressure is equal to that at constant volume. Estimate (a)The pressure and temperature at the cardinal points of the cycle(b) The cycle efficiency (c) the mean effective pressure (for air Cp=1.005kj/kg. k , Cv = 0.717 kJ/kgk, and R=0.287 kJ/kgk) 7M

b A diesel Engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the Air standard efficiency. 5M

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