Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2142004 **Date:10/12/2018**

Subject Name:Engineering Thermodynamics

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define following terms: (1) Isolated system, (2) Intensive property (3) Extensive property	**03**
	(b)	Explain Quasi-static Process with diagram.	**04**
	(c)	Prove the equivalency of Kelvin-Plank and Clausius statements.	**07**
Q.2	**(a)**	Explain what is meant by PMM1.Why is such a device not possible?	**03**
	(b)	What do you mean by Thermal equilibrium? Explain it with suitable examples.	**04**
	(c)	Write steady flow energy equation in case of diffuser, boiler, turbine, nozzle, pump, heat exchanger and condenser.	**07**
		OR	
	(c)	Derive expression for air standard efficiency of diesel cycle.	**07**
Q.3	**(a)**	Explain. Discuss limitations of first law of thermodynamics.	**03**
	(b)	Define Entropy and show that it is a property of the system.	**04**
	(c)	Write note on reversibility and irreversibility.	**07**
		OR	
Q.3	**(a)**	Give statements for second law of thermodynamics.	**03**
	(b)	State and prove Carnot's theorem.	**04**
	(c)	Explain briefly Otto cycle with help of p-v and T-s diagram and derive an expression for ideal efficiency of Otto cycle.	**07**
Q.4	**(a)**	What do you understand by Joule-Thomson coefficient?	**03**
	(b)	Derive the two T- ds equation starting from the basics.	**04**
	(c)	A heat engine is operated between 700° C and 30° C. It drive a heat pump which works between 100° C and 30° C. Efficiency and COP of the heat engine and the heat pump are half of that of corresponding Carnot values. Calculate amount of heat rejected by heat pump at 100° C when 100 KJ is absorbed by heat engine at 700° C.	**07**
		OR	
Q.4	**(a)**	Explain Zeroth law of thermodynamic.	**03**
	(b)	Write comparison of Carnot and Rankine cycle.	**04**
	(c)	Compare otto, diesel and dual cycle for (1) Constant maximum pressure and heat input. (2) Same maximum pressure and temperature.	**07**

Q.5	**(a)**	State and explain law of corresponding states.	**03**
	(b)	State and explain Dalton's law of partial pressure .	**04**
	(c)	In an air standard Otto cycle, the maximum and minimum temperatures are 1600°C and 20°C. The heat supplied per kg of air is 900 kJ. Determine the compression ratio, the cycle efficiency and the ratio of maximum to minimum pressure in the cycle. Take C_v = 0.718 kJ/kg K and $\gamma = 1.4$	**07**

OR

Q.5	**(a)**	Define heat engine. Also explain the need for a sink in a heat engine.	**03**
	(b)	State and explain Avogadro's law	**04**
	(c)	In an ideal Diesel cycle, the temperature at the beginning and at the end of compression are 57°C and 603°C respectively. The temperature at the beginning and end of expansion are 1950°C and 870°C respectively. Determine the ideal efficiency of the cycle. If the pressure at the beginning is 1bar, calculate the maximum pressure in the cycle.	**07**

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