Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – SUMMER • 2014

Subject Code: 133401 **Date: 23-05-2014**

Subject Name: Thermodynamics and Thermal Engineering

Time: 02.30 pm - 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.**

Q.1	**(a)**	Define thermodynamics and its related basic terminologies such as system, surrounding, state, process and also explain scope of thermodynamics.	**07**
	(b)	State the first law for a closed system undergoing a cycle.	**07**
Q.2	**(a)**	Write the steady flow energy equation for a single stream entering and a single stream leaving a control volume and explain the various terms in it.	**07**
	(b)	Give the Kelvin Planck & clausius statement of the second low.	**07**
		OR	
	(b)	1.5 kg of liquid having a constant specific heat of 2.5 kJ/kg K is stirred in a well insulated chamber causing the temperature to rise by 15° C. Find ΔE and W for the process.	**07**
Q.3	**(a)**	Explain in detail Diesel cycle with neat sketch.	**07**
	(b)	In an air standard diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is 15° C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process is 1480° C. Calculate: (a) The cut-off ratio (b) the heat supplied per kg of air, (c) the cycle efficiency.	**07**
		OR	
Q.3	**(a)**	How does Brayton cycle compare with Rankine cycle?	**07**
	(b)	Explain the PVT behavior of pure substance with the help of PT & PV diagrams.	**07**
Q.4	**(a)**	Explain the principal of psychometric and refrigeration and air condition.	**07**
	(b)	What is an absorption refrigeration cycle? How does it differ from Vapour compression cycle?	**07**
		OR	
Q.4	**(a)**	Derive the expression for the maximum COP of an absorption refrigeration system.	**07**
	(b)	Explain the vapour compression refrigeration cycle with neat diagram.	**07**
Q.5	**(a)**	A composite wall is made up of two slabs with outermost surface temperatures maintained at (T1) 1300°C and (T3) 115°C. The first slab has a thickness of 500 mm (L1) and thermal conductivity (K1) of 1.4W/m K and the thickness and the thermal conductivity (K2) of the second slab are 161 mm (L2) and 0.35 W/m K, respectively. Calculate the conduction heat transfer through this composite wall per square meter and the temperature of the surfaces in contact.	**07**
	(b)	Explain the basic of convective heat transfer and equation with help of a neat diagram.	**07**
		OR	
Q.5	**(a)**	Explain the basic of radiation mode of heat transfer with help of a neat diagram.	**07**
	(b)	A cyclic heat engine operates between a source temperature of 800° C and a sink temperature of 30° C. What is the least rate of heat rejection per kW net output of the engine?	**07**

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