Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–I • EXAMINATION – SUMMER • 2014

Subject Code: X11902 **Date: 17-06-2014**

Subject Name: Engineering Thermodynamics

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 Thermodynamic system. Also explain different thermodynamic systems with suitable examples.	**07**
	(b)	What is thermodynamic equilibrium? Explain types of thermodynamic equilibrium with suitable examples.	**07**
Q.2	**(a)**	Explain zeroth law of thermodynamics. How zeroth law can apply to compare different types of thermometers.	**07**
	(b)	Explain different types of work transfer with suitable examples.	**07**
		OR	
	(b)	Give broad classification of energy. Explain each types in brief.	**07**
Q.3	**(a)**	Derive the energy balance equation for any steady flow process.	**07**
	(b)	In a steam power station, steam flows steadily through a 0.2 m diameter pipeline from the boiler to turbine. At the boiler end, the steam pressure 4 MPa, temperature 400°C, enthalpy 3213.6 kJ/kg and specific volume is 0.073 m^3/kg. At the turbine end, the steam pressure 3.5 MPa, temperature 392°C, enthalpy 3202.6 kJ/kg and specific volume is 0.084 m^3/kg. There is a heat loss of 8.5 kJ/kg from the pipeline. Calculate the steam flow rate.	**07**
		OR	
Q.3	**(a)**	State and explain equivalence of Kelvin-Plank and Clausius statements	**07**
	(b)	Which is the more effective way to increase the efficiency of Carnot engine: to increase T_1 by keeping T_2 constant; or to decrease T_2 by keeping T_1 constant? Prove it. Take $T_1 > T_2$.	**07**
Q.4	**(a)**	With usual notation prove that $\frac{dQ}{T} \le ds$ for any process undergone by system	**07**
	(b)	A fluid undergoes a reversible adiabatic compression from 0.5 MPa, 0.2 m^3 to 0.05 m^3 according to law pv$^{1.3}$=constant. Determine the change in enthalpy, internal energy, entropy, heat transfer and work transfer during the process.	**07**
		OR	
Q.4	**(a)**	Explain actual vapour power cycle with T-S diagram. Explain different losses in actual vapour power cycle.	**07**
	(b)	Explain ideal regenerative cycle with schematic and T-S diagram.	**07**
Q.5	**(a)**	Give name of different gas power cycle with P-V and T-S diagram of each.	**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) cut-off ratio, (b) the heat supplied per kg of air, (c) cycle efficiency and (d) m.e.p. Take c_p=1.005 kJ/kgK, c_v=0.718 kJ/kgK	**07**
		OR	
Q.5	**(a)**	Explain concept of available Energy, unavailable Energy and lost work.	**07**
	(b)	What is reduced properties and compressibility factor? Draw and explain Generalized compressibility chart.	**07**

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