Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2015

Subject code: 2131905 **Date: 04/06/2015**
Subject Name: Engineering Thermodynamics
Time: 02.30pm-05.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **~~Tables for properties of air and water~~, Steam tables, ~~Psychometric chart~~ is permitted.**

Q.1	**(a)**	Define property. What is meant by intensive and extensive property? State the differences between Microscopic approach and macroscopic approach.	**07**
	(b)	State the Steady Flow Energy Equation and explain how this equation can be applied for (i) Nozzle, (ii) Boiler, and (iii) Steam Turbine.	**07**
Q.2	**(a)**	The mass flow rate of steam into a steam turbine is 1.5 Kg/s and heat loss from the turbine is 8.5 KW. The steam is entering the turbine at the pressure of 2MPa, temperature 350^0C, Velocity 50 m/s, elevation 6 m/s and is leaving the turbine at a pressure of 0.1 MPa, quality of 100%, velocity of 200 m/s, elevation of 3 m/s. Determine power output of turbine.	**07**
	(b)	State Kelvin-Plank Statement of Second Law of thermodynamics and show that violation of Kelvin-Plank statement leading to violation of Clausius statement.	**07**
		OR	
	(b)	A heat pump is used to heat the house in winter. A house requires 50 KJ/s heat for heating in winter which is delivered by heat pump from outside air. Work required to operate the heat pump is 8 KW. Calculate the Co-efficient of Performance of heat pump and heat abstracted from outside.	**07**
Q.3	**(a)**	Explain principle of increase of entropy for an isolated system.	**07**
	(b)	What is irreversibility? State various types of irreversibilities and explain them.	**07**
		OR	
Q.3	**(a)**	Explain the concept of decrease in available energy when heat is transferred through a finite temperature difference with the aid of T-S diagram.	**07**
	(b)	5 kg of water at 0^0C is exposed to reservoir at 98^0C. Calculate the change of entropy of water, reservoir and universe. Assume that specific heat of water is 4.187 KJ/Kg-K.	**07**
Q.4	**(a)**	Draw Rankine cycle on P-v, T-s and h-s diagrams and derive an expression for its thermal efficiency with and without pump work.	**07**
	(b)	An engine working on Diesel cycle has cylinder bore of 190 mm and piston stroke of 230 mm. The clearance volume is 290 cm^3. The fuel injection takes place at constant pressure for 6% of the stroke. Determine the air standard cycle efficiency.	**07**
		OR	
Q.4	**(a)**	Compare Otto, Diesel and Dual cycle for i) Same compression ratio and heat supplied ii) Same Max. Pressure and temperature.	**07**

	(b)	Dry and saturated steam at pressure of 10.5 bar is supplied to a turbine and expanded isentropically to a pressure 0.075 bar. Calculate Thermal efficiency of Rankine cycle.	**07**
Q.5	**(a)**	What is regeneration in gas turbine plant? How it improves thermal efficiency of simple open cycle Gas Turbine Plant. Explain it with the help of schematic diagram and T-S Diagram of the cycle.	**07**
	(b)	State the statements of Dalton's Law and Gibbs-Dalton Law. Explain in detail Dalton's law of partial pressures.	**07**

OR

Q.5	**(a)**	How actual Brayton cycle differes from the theoretical cycle? Explain with the help of T-S diagram.	**07**
	(b)	What is the Vander waal's equation of state? State its importance and derive it.	**07**

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