Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) EXAMINATION – SUMMER 2016

Subject Code:2142004 Date:06/06/2016

Subject Name:Engineering Thermodynamics

Time:10:30 AM to 01:00 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		**Short Questions**	**14**
	1	What is throttling process?	
	2	Write Study Flow Energy Equation.	
	3	Any process or series of processes whose end states are Identical is termed a "Cycle". **True Or False**	
	4	Draw p-v and T-s diagram of constant pressure cycle.	
	5	A Centrifugal pump forms an_____ system.	
	6	Specific volume is a _____ property.	
	7	Pressure cooker is an example of _____system	
	8	A chemical fuel is a substance which releases _____ on combustion. (a) Chemical energy (b) heat energy (c) sound energy (d) magnetic energy	
	9	In a reversible cycle, entropy of the system……. (a) Increases (b) decreases (c) does not change (d) first increases and then decreases	
	10	Work done in a free expansion processes is… (a) Zero (b) positive (c) negative (d) maximum	
	11	Absolute zero temperature is taken as (a) -273^0 C (b) 273^0C (c) 237^0C (d) – 373^0C	
	12	The relation of vapour pressure to the enthalpy of vaporization is expressed in : (a) Vander Waals equation (b) Maxwell's equation (c) Gas equation (d) Clausius-Claypeyron equation	
	13	Orsat apparatus is used to find the analysis of flue gases.. (a) By mass (b) by volume (c) by mass of DFG (d) by volume of DFG	
	14	Kelvin-Planck statement relates to: (a) Conversion of energy (b) transfer of heat energy (c) conversion of heat into work (d) conversion of work into heat	
Q.2	**(a)**	Explain Thermodynamic Equilibrium	**03**
	(b)	Explain Quasi-equilibrium Process with diagram.	**04**
	(c)	Explain formation of steam with T-h Diagram.	**07**
		OR	
	(c)	Explain Joule's Experiment	**07**

Q.3	**(a)**	Write Steady Flow Energy Equation for….. (1) Nozzle (2) Hydraulic Pump (3) Heat Exchanger.	**03**
	(b)	Prove the equivalency of Kelvin-Plank and Clausius statements.	**04**
	(c)	Explain Absolute Thermodynamic Temperature Scale.	**07**
		OR	
Q.3	**(a)**	Explain Zeroth law of thermodynamic.	**03**
	(b)	Define Entropy and show that it is a property of the system.	**04**
	(c)	A Carnot engine receives 4000 KJ as heat addition at 337^0C and rejects energy at triple point of water. Calculate (1) Thermal efficiency (2) The net work output in KJ If the efficiency of an irreversible engine is 70 % of Carnot engine. Find the % change in heat rejected for the same input and fluid temperature.	**07**
Q.4	**(a)**	Why Rankine cycle is considered as an Ideal cycle for steam power Plant instead of Carnot cycle?	**03**
	(b)	Explain Following Terms. (1) Heat engine 2. Heat pump 3. Heat source 4. Heat sink.	**04**
	(c)	In a ideal Brayton cycle, the ambient air at 1 bar, 300 K is compressed to 6 bar and the maximum cycle temperature is limited to 1200 K. If the heat supply is 120 MW, Find (i) The thermal efficiency of the cycle (ii) Work ratio (iii) Power output and (iv) mass flow rate of air.	**07**
		OR	
Q.4	**(a)**	Explain Carnot's Theorem.	**03**
	(b)	Show that efficiency of an air standard Otto cycle is a function of compression ratio only.	**04**
	(c)	In an air standard diesel cycle, the compression ratio is 16. At the beginning of isentropic compression the temperature is 15^0C and pressure is 0.1 MPa. Heat is added until the temperature at the end of constant pressure process is 1480^0C. Calculate. (1) Cut off ratio (2) cycle efficiency (3) Mean effective pressure Take $\gamma = 1.4$, R = 287 NM / Kg K, C_V = 0.718 KJ / Kg K , CP = 1.005 KJ / Kg K, Assume mass of air = 1 Kg.	**07**
Q.5	**(a)**	Differentiate between mass fraction and mole fraction.	**03**
	(b)	Describe with a net sketch the working of Throttling calorimeter.	**04**
	(c)	Using Maxwell relations derive the Clausius-Claypeyron equation	**07**
		OR	
Q.5	**(a)**	State Avogadro's law.	**03**
	(b)	Define: (1) Exothermic reaction (2) endothermic reaction	**04**
	(c)	Following result were obtained when a sample of gas was tested by Junker's gas calorimeter. Volume of sampled gas : 0.08 m^3 Pressure of gas supply : 52 mm of water , temperature of gas : 12^0C Barometric pressure : 750 mm of Hg Weight of water heated by gas :30 kg, Temperature difference of circulated water : 15^0C Steam Condensate collected :0.06 kg Determine the higher and lower calorific value per m^3 of gas at temperature of 15^0C and barometric pressure of 760 mm of Hg.	**07**

****