Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV EXAMINATION – SUMMER 2015

Subject Code:141903 **Date: 28/05/2015**

Subject Name: Engineering Thermodynamics

Time:10.30am-01.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of steam tables is permitted.**

Q.1	**(a)**	Derive the general equation for steady flow process. Explain the physical significance of several terms of the equation.	**07**
	(b)	3 Kg of air at 1.5 bar pressure and 77 °C temperature at state is compressed polytropically to state 2 at pressure 7.5 bar, index of compression being 1.2.It is then cooled at constant temperature to its original state 1. Calculate the net work done and heat transferred.	**07**
Q.2	**(a)**	Explain the following terms: Point Function, Homogenous system, First law of thermodynamics, Quasi-static process, pure substance.	**07**
	(b)	Explain the concept of temperature and differentiate between heat, temperature and internal energy.	**07**
		OR	
	(b)	Derive an expression for emptying and filling process.	**07**
Q.3	**(a)**	Explain Carnot cycle and derive necessary expression.	**07**
	(b)	A Carnot engine getting heat at 800 K is used to drive a Carnot refrigerator maintaining 280 K temperature. Both engine and refrigerator reject heat at same temperature T when heat given to engine is equal to heat absorbed by refrigerator. Determine efficiency of engine and COP of refrigerator.	**07**
		OR	
Q.3	**(a)**	Define Clausius inequality and prove it.	**07**
	(b)	Explain the following terms: Helm-Holtz, Clausius- Claperyon equation, Joule-Thomson coefficient.	**07**
Q.4	**(a)**	With usual notations derive an expression for air standard efficiency of Otto cycle.	**07**
	(b)	The pressure limits in an Otto air cycle are 100 k N /m^2 and 2000 k N/ m^2 resply. The compression ratio is 4. Calculate the thermal efficiency and mean effective pressure assume γ=1.4 for air.	**07**
		OR	
Q.4	**(a)**	With line diagram explain Rankine cycle and represent it on p-v, T-S, and H-S diagrams.	**07**
	(b)	Compare Otto, diesel and dual cycles on basis of 1. Equal compression ratio and heat input. 2. Constant maximum pressure and heat input. 3. Constant maximum pressure and output. 4. Constant maximum pressure and temperature.	**07**
Q.5	**(a)**	Explain the following terms: Avogadro's law, Equation of state, law of corresponding states.	**07**
	(b)	Write short note on "Bomb calorimeter".	**07**
		OR	
Q.5	**(a)**	Explain the concept of available and unavailable energy.	**07**
	(b)	Explain the following terms: Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.	**07**

****