Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 2130405 **Date: 18-12-2014**

Subject Name: 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		Explain PVT behavior of pure substances with PT diagram and PV diagram in detail. Also, include phase rule and definition of gas, vapor and liquid in your description.	**14**
Q.2	**(a)**	Derive equation for constants "a" and "b" of Vander Waals equation of state in terms of critical constants of substances.	**07**
	(b)	Define Entropy and irreversibility. Discuss their relationships.	**07**
		OR	
	(b)	Give various statement of the second law of thermodynamics.	**07**
Q.3	**(a)**	Define and discuss the First law of Thermodynamics in its various form. What are its limitations?	**07**
	(b)	Write a note on virial equation of states for gases.	**07**
		OR	
	(a)	What is cubic equation of state? State application of it. Also, mention some cubic equation of state.	**07**
	(b)	Discuss the Carnot refrigerator.	**07**
Q.4	**(a)**	With neat sketch explain the Vapor compression cycle.	**07**
	(b)	Explain system and surroundings. Also discuss the scope of thermodynamics.	**07**
		OR	
Q.4	**(a)**	Write a note on Standard heat of reaction, Standard heat of formation, Standard heat of combustion.	**07**
	(b)	What is steady flow process? Explain mass balance and energy balance in open system.	**07**
Q.5	**(a)**	Write four Maxwell's equation and drive the equation for enthalpy and entropy as functions of temperature and pressure.	**07**
	(b)	Define Hess law and using Hess's law, calculate the heat of formation of methane gas from the following heat of combustion data	**07**

a) $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O(l)$; $\Delta H\ 298 = -890.94$ KJ
b) $C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}$; $\Delta H\ 298 = -393.78$ KJ
c) $H_{2(g)} + ½\ O_{2(g)} \rightarrow H_2O\ (l)$; $\Delta H\ 298 = -286.03$ KJ

OR

Q.5 **(a)** Write a short note on Thermodynamic diagram and discuss in brief P-H diagram. **07**

(b) Describe Zeroth law and write its application. **07**

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