Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-I • EXAMINATION – WINTER 2013

Subject Code: X11902Date: 24-12-2013Subject Name: Engineering ThermodynamicsTime: 10.30 am - 01.00 pmTotal Marks: 70Instructions:1. Attempt any five questions.Total Marks: 702. Make suitable assumptions wherever necessary.3. Figures to the right indicate full marks.4. Each question carry equal marks (14 marks)			
Q.1	(a)	Define pure substance. What is critical point and triple point? State the	07
	(b) (c)	Derive the general equation for steady flow process. Define terms 1) available energy 2) dead state.	05 02
Q.2	(a) (b)	Gas enters a nozzle at 15 bar and 1500 K with a velocity of 30 m/s. The pressure at the exit of the nozzle is 5 bar. If the nozzle efficiency is 90%, calculate the actual exit velocity. Neglect changes in P.E. and heat exchanger between nozzle and surrounding. Take $C_p = 1.005$ kJ/kg K. Define the Closed system, Open system and Isolated system. Give the	07 05
	(c)	example of each system. Define terms 1) Excess air 2) Air fuel ratio.	02
Q.3	(a) (b) (c)	Explain adiabatic mixing of perfect gases in detail. State and prove the Clausious theorem. State the limitations of first law of thermodynamics.	07 05 02
Q.4	(a) (b) (c)	Derive Maxweill's equation from basics. Explain the Enthalpy of formation in detail. Define terms 1) Intensive property 2) Extensive property.	07 05 02
Q.5	(a)	An engine operating on Diesel cycle has maximum pressure and temperature of 45 bar and 1500° C. Pressure and temperature at the beginning of compression are 1 bar and 27° C. Determine air standard efficiency of the cycle. Take $x = 1.4$ for air	07
	(b)	What is compressibility chart? What are the observations can be made from this chart?	05
	(c)	Define terms 1) reduced properties 2) partial pressure.	02
Q. 6	(a) (b) (c)	Explain the working of Orsat apparatus with neat sketch. Explain Joule-Kelvin effect with various diagrams. Explain Perpetual motion machine of the first kind.	07 05 02
Q. 7	(a) (b) (c)	Prove the equivalence of Clausius and Kelvin-Plank statement of second law of thermodynamics. Explain the working of Rankine cycle with the help of schematic diagram. Draw the P-v and T-s diagram of Otto cycle.	07 05 02
