Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - Ist Semester–Examination – May/June- 2012

Subject code: X11902

Subject Name: Engineering Thermodynamics

Date:02/06/2012 **Time: 10:30 am – 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.**

Q.1	**(a)**	Write in brief about thermodynamic equilibrium of a system.	**07**
	(b)	Explain the first law for a closed system undergoing a change of state.	**07**
Q.2	**(a)**	Explain the application of steady flow energy equation to nozzle and diffuser.	**07**
	(b)	Write the Kelvin-Plank and Clausius's statements for second law of thermodynamics and discuss their equivalence.	**07**
		OR	
	(b)	Explain Carnot theorem with suitable thermodynamic system	**07**
Q.3	**(a)**	Explain briefly the processes of diesel cycle and derive the equation for efficiency of diesel cycle.	**07**
	(b)	A heat engine operates in a cycle between a source temperature 900^0C and a sink temperature of 30^0C. What is the amount of heat rejection per kW net output of the engine?	**07**
		OR	
Q.3	**(a)**	Explain entropy change in irreversible process.	**07**
	(b)	In an ideal Brayton cycle, air from the atmosphere at 1 atm, 300 K is compressed to 6 atm and maximum cycle temperature is limited to 1100 K with the use of large air-fuel ratio. If the heat supply is 100MW, find i. The thermal efficiency of the cycle ii. Work ratio iii. Power output	**07**
Q.4	**(a)**	Explain Rankine cycle with p-v, and T-s diagram.	**07**
	(b)	What is available energy? Discuss about available energy referred to a cycle.	**07**
		OR	
Q.4	**(a)**	Explain the p-v diagram of Carnot cycle and derive the equation for efficiency of cycle.	**07**
	(b)	Explain bomb calorimeter with neat sketch.	**07**
Q.5	**(a)**	Discuss the Dalton's law of partial pressures for mixture of gases.	**07**
	(b)	A fuel has following composition by mass: Carbon 86%, Hydrogen 11.75%, Oxygen 2.25%. Calculate, i. The theoretical air supply per kg of fuel, and ii. Mass of products of combustion per kg of fuel.	**07**
		OR	
Q.5	**(a)**	Derive the equation for entropy change of an ideal gas from the general property relations.	**07**

(b) The ultimate analysis of dry coal burnt in a boiler is C 84%, H_2 9% and incombustibles 7% by mass. Determine the mass of dry flue gases per kg of coal burnt, if the volumetric composition of the flue gas is : **07**

CO_2 8.75%, CO 2.25%, O_2 8% and N_2 81%

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