Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-IV Examination-Nov/Dec-2011

Subject code: 141903 **Date: 25/11/2011**

Subject Name: Engineering Thermodynamics

Time: 02.30 pm -5.00 pm **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 molier chart and steam table is permitted.**

Q-1	**(a)**	State the purpose served by each thermodynamic law	**07**
	(b)	What the meaning of word "Entropy "?	**03**
	(c)	Carnot cycle is not practical. Justify.	**04**
Q.2	**(a)**	What is the difference between Otto cycle and diesel cycle? Explain why the higher efficiency of the Otto cycle compared to diesel cycle for the same compression ratio is not a result of practical importance.	**07**
	(b)	An air standard Otto cycle is required to operate between the temperature limits of 300k and 1800k. Estimate the optimum compression ratio and the corresponding thermal efficiency.	**07**
		OR	
	(b)	In an air standard diesel cycle the compression ratio is 16. At the beginning of isentropic compression the temperature is 15^{o} c and pressure is 0.1 MPa. Heat is added until the temperature at the end of constant pressure process is 1480^{0} c . Calculate (1) cut off ratio. (2) cycle efficiency (3) M. E. P. Take, $\gamma = 1.4$, R = 287 NM/Kg K, $C_v = 0.718$ KJ/Kg K, $C_P = 1.005$ KJ/Kg K Assume Mass of air = 1 Kg	**07**
Q.3	**(a)**	Explain the concept of available energy, unavailable energy.	**07**
	(b)	What is the law of degradation of energy?	**04**
	(c)	State the Clausis Clapeyron equation.	**03**
		OR	
Q.3	**(a)**	Using Maxwell relations derive the Causius clapeyron equation.	**07**
	(b)	What is dead state and why it is referred in the concept of availability?	**03**
	(c)	The same amount of heat loss at higher temperature is more harmful than that at a lower temperature discuss.	**04**

Q.4	**(a)**	Why the Carnot engines is the most efficient engine for a given source and sink temperature? Explain.	**07**
	(b)	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**

OR

Q.4	**(a)**	Differentiate between internal energy of reaction and enthalpy of reaction.	**04**
	(b)	Discuss the method for determining the calorific value of solid and liquid fuels.	**07**
	(c)	Define: (1) exothermic reaction (2) endothermic reaction	**03**

Q.5	**(a)**	Explain Binary vapour cycle with P-V and T-S diagram.	**07**
	(b)	A steam turbine of a power plant operating on ideal rankine cycle receives steam at 20 bar, 300^0 c at the rate of 3 Kg/s and it exhausts at 0.1 bar. Determine the following (1) Net power output (2) Rankine cycle efficiency	**07**

OR

Q.5	**(a)**	Why Carnot cycle is not practical for steam power plants? Explain in brief.	**05**
	(b)	Derive Vander wall's equation.	**05**
	(c)	Explain 1. Isothermal compressibility 2. Adiabatic compressibility	**04**

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