

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-IV Remedial Examination Nov/ Dec. 2010****Subject code: 141903****Subject Name: Engineering Thermodynamics****Date: 01 /12 /2010****Time: 03.00 pm – 05.30 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) Define **08**
1. Heat engine
 2. Heat pump
 3. Heat source
 4. Heat sink
- (b) Discuss macroscopic and microscopic point of view in thermodynamics **03**
- (c) Write steady flow energy equation in case of boiler, turbine and condenser. **03**
- Q.2** (a) Derive an expression for Otto cycle efficiency with usual notation. **07**
- (b) An air standard Otto cycle has a compression ratio of 8. At the start of the compression process, the temperature is 26° C and the pressure is 1bar. If the max. temperature of the cycle is 1080° C calculate, **07**
- (a) The heat supplied per kg of air.
 - (b) The thermal efficiency of the cycle.
- OR**
- (b) Show that for the max. work to be done per kg of air in Otto cycle between upper and lower limits of absolute temperature T_3 and T_1 respectively, the ratio of compression should have the value $(T_3/T_1)^{1.25}$ When $\gamma = 1.4$ **07**
- Q.3** (a) Explain Clausius theorem. **03**
- (b) State various reasons for irreversibility in system. How does mechanical reversibility differ from thermodynamic reversibility? **06**
- (c) Explain concept of available Energy, unavailable Energy and lost work. **05**
- OR**
- Q.3** (a) What are the Maxwell's relations explain in brief. **03**
- (b) Derive the Claperyon's equation. What is its use? **06**
- (c) Define entropy and show that it is a property of system **05**
- Q.4** (a) Derive an expression for Carnot efficiency with usual notation. **07**
- (b) A Carnot cycle has lowest pressure and temperature equal to 1bar & 20° C. pressure after Isothermal compression is 4 bar. Pressure after isentropic compression is 12 bar and after Isothermal heat addition process is 6 bar. Calculate. **07**
1. The highest temp. in the cycle.
 2. The change in entropy during Isothermal explain.
 3. Heat added to the cycle.
 4. Heat reflected by the cycle.
- OR**
- Q.4** (a) Explain Rankine cycle. **07**
- (b) Explain Binary vapour cycle with P-V and T-S diagram. **07**

- Q.5** (a) What is higher and lower calorific value of fuel? Explain in brief **04**
 (b) Explain in brief how calorific value is determined by Bomb calorimeter and Junkers gas calorimeter. **07**
 (c) Explain in brief: **03**
 1. Entropy of formation
 2. Entropy of reaction

OR

- Q.5** (a) Derive Vander wall's equation **04**
 (b) Explain: **06**
 1. Coefficient of volume expansion.
 2. Isothermal compressibility.
 3. Adiabatic compressibility.
 (c) Explain third law of thermodynamics. **04**
