

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (OLD) - EXAMINATION – SUMMER 2017****Subject Code: 142501****Date: 01/06/2017****Subject Name: Heat Power Engineering****Time: 10:30 AM to 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) State and Explain the second law of thermodynamics as per (i) Kelvin-Planck and (ii) Clausius, and prove that both statements are equivalent although they appear to be different. **07**
- (b) (1) Give Comparison of 1st Law and 2nd Law of Thermodynamics: **04**
(2) Differentiate homogeneous and heterogeneous system. **03**
- Q.2** (a) Explain Carnot cycle. Derive the equation for efficiency of Carnot cycle. **07**
- (b) Derive the expression for thermal efficiency for air standard Otto cycle and prove that for maximum work, the compression ratio should be $r = \left(\frac{T_3}{T_1}\right)^{1.25}$ (Assume $\gamma=1.4$) **07**
- OR**
- (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. (Assume $\gamma=1.4$) **07**
- Q.3** (a) What is steam nozzle? Explain the effect of friction on the steam flow through nozzle. **07**
- (b) What is steam turbine? Differentiate between impulse and reaction turbine. **07**
- OR**
- Q.3** (a) (i) List down different Refrigerant and Write short note on "Refrigerant". **04**
(ii) Discuss advantages of closed cycle over open cycle gas turbine. **03**
- (b) What is meant by compounding of steam turbine? Explain the Velocity Compounding in detail. **07**
- Q.4** (a) Explain Concept of black body And application heat transfer in heat exchanger. **07**
- (b) Explain with sketch construction and working of reciprocating air compressor. **07**
- OR**
- Q.4** (a) Write short note on Heat exchanger. **07**
- (b) A Carnot refrigerator extracts 100 kcal of heat per minute from a cold room which is maintained at -15 °C and it is discharged to atmosphere which is maintained at -30° C. Find the ideal H.P. required to run the unit. **07**
- Q.5** (a) Explain Bell Coleman air refrigeration cycle. **07**
- (b) Explain: (i) Thermal Equilibrium (ii) Entropy. **07**
- OR**
- Q.5** (a) Classify the thermodynamic properties. **07**
- (b) Explain the following as referred to air compressor: (i) Isothermal efficiency, (ii) Volumetric efficiency, (iii) Free Air Delivered and (iv) NTP Condition. **07**
