

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – WINTER 2013****Subject Code: 142501****Date: 19-12-2013****Subject Name: Heat Power Engineering****Time: 02:30 pm to 05:00 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 the second law of thermodynamics as per (i) Kelvin-Plank and (ii) Clausius, and prove that both statements are equivalent although they appear to be different. **07**
- (b) Obtain an expression for the efficiency of Diesel Cycle with usual notations. **07**

- Q.2** (a) Explain with neat sketch a single stage impulse turbine. **07**
- (b) Explain with the help of neat sketch the working of a single stage reciprocating air compressor. **07**

OR

- (b) Explain the following as referred to air compressor: **07**
- (i) Isothermal efficiency, (ii) Volumetric efficiency, (iii) Free Air Delivered and (iv) NTP Condition

- Q.3** (a) Describe giving neat sketch the cycle of operation of a simple constant pressure open cycle Gas Turbine. **07**
- (b) Explain the working of Vapour Compression Refrigeration system with neat sketch. **07**

OR

- Q.3** (a) What is meant by the term Jet Propulsion? Describe briefly the working of a Turbo-Jet Engine. **07**
- (b) Define the following terms: **07**
- (i) Dry bulb temperature, (ii) Wet bulb temperature, (iii) Specific Humidity, (iv) Relative Humidity, (v) Degree of saturation, (vi) Dew point temperature and (vii) Psychrometry.

- Q.4** (a) Discuss the applications of steady flow energy equation for (i) Boiler, (ii) Heat exchanger and (iii) Compressor. **07**
- (b) A reversible engine receives heat from two constant temperature sources at 870° K and 580° K. It rejects 3000 KJ/min to a sink at 290° K. The engine develops 85 KW. Determine the heat supplied by each source and the efficiency of the engine. **07**

OR

- Q.4** (a) 2.5 kg of air at 27° C and 1000KN/m² is expanded to 5 times its initial volume. The law of expansion being $PV^{1.3} = C$. Find the change in entropy. **07**
- (b) What is meant by compounding of steam turbine? Explain the Velocity Compounding in detail. **07**

- Q.5 (a)** An engine working on Otto cycle has a volume of 0.5m^3 , pressure 1 bar and temperature 27°C at the beginning of compression stroke. The pressure at the end of compression is 10bar. The heat added during constant volume process is 200KJ. Calculate: (a) percentage clearance, (b) efficiency and (c) mean effective pressure. **07**

- (b)** Explain different modes of heat transfer. **07**

OR

- Q.5 (a)** Write short note on Heat exchanger. **07**

- (b)** A single acting single stage compressor is belt driven from an electric motor at 400 rpm. The cylinder diameter is 150mm and the stroke 175mm. The air is compressed from 1 bar to 7 bar and the law of compression $PV^{1.3} = C$. Find the power of the motor, if transmission efficiency is 97% and the mechanical efficiency of the compressor is 90%. Neglect clearance effect. **07**
