Seat No.: _____ Enrolment No._____

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) Clausis, 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: (i) Isothermal efficiency, (ii) Volumetric efficiency, (iii) Free Air Delivered and (iv) NTP Condition	**07**
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: (i) Dry bulb temperature, (ii) Wet bulb temperature, (ii)Specific Humidity, (iv)Relative Humidity, (v) Degree of saturation, (vi) Dew point temperature and (vii)Psychrometry.	**07**
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/m^2 is expanded to 5 times its initial volume. The law of expansion being $PV^{1.3}$ =C. Find the change in entropy.	**07**
Q.4	**(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**

****