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

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-III Examination-Dec.-2011

Subject code: 133401 **Date: 13/12/2011**

Subject Name: Thermodynamics and Thermal Engineering

Time: 2.30 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.**

Q.1 **(a)** (i) Explain "Zeroth Law of Thermodynamics" **03**

(ii) Explain Clausius and Kelvin-Plank Statement **04**

(b) Define First Law of Thermodynamics. Derive the Steady flow Energy equation (SFEE). **07**

Q.2 **(a)** Derive the expressions of efficiency in Otto Cycle. **07**

(b) Define Entropy. Explain Clausius inequality. **07**

OR

(b) Calculate the percentage loss in ideal efficiency of a diesel engine with compression ratio 14, if the fuel cut-off is delayed from 5% to 8%. **07**

Q.3 **(a)** Describe different operations of Rankine Cycle. Derive also the expression for its efficiency. **07**

(b) Define the term "Steam Nozzle". Explain various types of nozzles. **07**

OR

Q.3 **(a)** Explain working principle of Turbojet. Write the advantages of Turbojet. **07**

(b) (i) Differentiate between Jet propulsion and Rocket propulsion system. **04**

(ii) How to classify Rockets? **03**

Q.4 **(a)** Define the following terms:-

(i) Saturated air **03**

(ii) Dry-Bulb Temperature **02**

(iii) Dew point Temperature **02**

(b) Write the comparison between vapour compression system and vapour absorption system **07**

OR

Q.4 **(a)** A Carnot refrigerator requires 1.3 Kw per tonne of refrigeration to maintain a region at low temperature of –38 ° C. Determine:

(i) C.O.P of Carnot refrigerator
(ii) Higher temperature of the cycle
(iii) The heat delivered and C.O.P. when this device is used as heat pump. **07**

(b) How are air-conditioning systems classified? Explain with neat diagram the working of Central System of air-conditioning. **07**

Q.5 **(a)** An exterior wall of a house may be approximated by a 0.1 m layer of common brick (k = 0.7 W / m°C) followed by a 0.04 m layer of gypsum plaster (k = 0.48 W / m°C).What thickness of loosely packed rock wool insulation (k = 0.065 W / m°C) should be added to reduce the heat loss or (gain) through the wall by 80 percent? **07**

(b) Define the following:

(i) Radiation **02**
(ii) Emissivity **02**
(iii) Black Body **03**

OR

Q.5 **(a)** A thick walled tube stainless steel with 20 mm inner diameter and 40 mm outer diameter is covered with a 30 mm layer of asbestos insulation (k = 0.2 W / m°C). If the inside wall temperature of the pipe is maintained at 600°C and the outside insulation at 1000°C, calculate the heat loss per metre of length. **07**

(b) Briefly explain the following

(i) Parallel-flow heat exchangers. **07**
(ii) Counter-flow heat exchangers.

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