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

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 711107N **Date: 21/02/2012**
Subject Name: Automobile Refrigeration &A/C
Time: 10.30 am – 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.**
4. **Students are allowed to use their own tables and Charts.**

Q.1 **(a)** Briefly explain the actual vapour compression cycle with schematic diagram. **07**

(b) Compare the following process in a vapour compression cycle. **07**

(i) Dry versus Wet compression

(ii) Throttling versus Isentropic compression

Q.2 **(a)** Write a short note on air conditioning system of an automobile. **07**

(b) Derive an expression for COP of the vapour absorption system in terms of generator temperature. **07**

OR

(b) In an absorption type refrigeration the heat is supplied to NH_3 generator by condensing stream of kgf/cm^2 and 90 % quality. The evaporator temperature is -5 ^{0}C. Determine the maximum COP possible. If refrigeration load is 20 tons and actual COP is 70 % of maximum COP, find weight of stream required per hour. Take ambient temperature as 30^{0}C. **07**

Q.3 **(a)** Enlist the different types of refrigerants used for an automobile? Explain the Halocarbon refrigerant. **07**

(b) Explain the Eco – Friendly refrigerants with its necessity. **07**

OR

Q.3 **(a)** What is fog? Why does it appear in night hours in winter season and not in summer season? Show the process of fogging on the psychometric chart when two air streams are mixed together. **07**

(b) Explain the thermodynamic and chemical properties of automotive refrigerants. **07**

Q.4 **(a)** Define psychrometry. What do you mean by psychometric properties? **07**

(b) Distinguish the factors between unitary & Central air conditioning system. **07**

OR

Q.4 **(a)** Write a brief note on human comfort and explain the factors affecting on it. **07**

(b) 5 grams of water vapour per kg of atmospheric air is removed and temperature of air after removing the water vapour becomes 25^{0}C DBT. **07**

Find the following:

(i) Relative humidity.

(ii) Dew point temperature.

Assume condition of atmospheric air is 35^{0}C and 60 % RH and pressure is 1.033 kg/cm^2.

Q.5 **(a)** Explain the refrigerants circuit and ventilation circuit in automobile air conditioning system. **07**

(b) Explain the automobile air conditioning trouble shooting procedure. **07**

OR

Q.5 **(a)** Explain the different types of cooling loads. Also explain the how to calculate cooling loads for designing the air conditioning system. **07**

(b) The following data available for rear window of an automobile is made of 5 mm thick glass of thermal conductivity 0.8 W/m^2.deg. to defrost this window a thin transparent film type heating element has been fixed t its inner surface. For the condition given below, determine the heat load per unit area of window if a temperature maintains 5^0C is maintained at its outer surface. Interior air temperature and the corresponding surface co-efficient is 20^0 C and 12W/m^2.deg. Surrounding air temperature and the corresponding surface co-efficient -15^0 C & 70 W/m^2.deg. **07**

Out side design Condition : 43^0 C DBT , 16.4 gms/kg
In side design Condition : 26^0 C DBT , 11.1 gms/kg
Size : 2m X 1 X 1m height
No. of air change / hr = 1.5
No. of occupants : 03
Door opening/hr/occupants = 3
Use factor for door = 3

Calculate :

i) Heat Load
ii) Ventilation Load , m^3/min
iii) Assume due to outside air in KW , Assume standard air
iv) Total Load

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