Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: X 71901 **Date: 03/01/2013**

Subject Name: Refrigeration and Air-conditioning

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. **Use of Refrigeration Chart /Tables and Psychrometric chart is permissible.**

Q.1 **(a)** Define the following:- **07**

1) Refrigeration
2) Air-conditioning
3) Dry bulb temperature
4) Wet bulb temperature
5) Relative humidity
6) Psychrometry
7) Specific enthalpy

(b) Explain Boot-strap Air refrigeration system with neat sketch and derive the equation for Power Required and C.O.P. for this refrigeration system. **07**

Q.2 **(a)** 750 m^3/min of recirculated air at 21°C DBT and 11°C Dew point temperature is to be mixed with 250 m^3/min of fresh air at 30 °C DBT and 50 % R.H. Determine the Enthalpy, Specific volume , Humidity ratio and Dew point temperature of the mixture. **07**

(b) Classify all the types of Compressors. Discuss in brief about single stationary blade type rotary compressor with neat sketch. **07**

OR

(b) Explain Lithium-Bromide (Li-Br) Vapour Absorption refrigeration system with neat sketch. **07**

Q.3 **(a)** Explain in detail about 2-stage compression with water intercooler and liquid sub-cooler. Also derive the equation for power required and C.O.P. of the System. **07**

(b) What are the various Advantages and Dis-advantages of Steam Jet Refrigeration System? **07**

OR

Q.3 **(a)** What are the various Advantages and Limitations of Vapour Absorption refrigeration system over vapour compression Refrigeration System. Draw only the neat sketch of aqua-ammonia vapour absorption refrigeration system. **07**

(b) Define:- Effective Temperature **07**
Discuss in detail about the factors affecting the human comfort.

Q.4 **(a)** Short note on Year round Air-conditioning system with neat sketch. **07**

(b) What do you mean by duct? Classify the duct. Discuss in brief about Economic considerations in selection of duct. **07**

OR

Q.4 **(a)** A rectangular duct section of 600 mm x 330 mm size carries 80 m^3/min of air having density of 1.16 kg/m^3. Determine the equivalent diameter of duct if (1) The quantity of air carried in both the case is same **07**

(2) The velocity of air in both the case is same.

(b) Explain in detail about Fly wheel effect of building material **07**

Q.5 **(a)** Classify the various types of Fans. Also explain in brief about Fan Performance curves with necessary sketch. **07**

(b) Short note on Ice-manufacturing Unit. **07**

OR

Q.5 **(a)** Classify the Refrigerants. **07**

What are the various desirable Properties of Refrigerant?

(b) R-12 vapour compression refrigeration system has a condensing temperature of 45 °C and evaporating temperature of 0 °C. The refrigerating capacity is 8 tonnes. The liquid leaving the condenser is saturated liquid and compression is isentropic. Determine the following:- **07**

1) Refrigerant flow rate
2) Power required to run the compressor.
3) The heat rejected in the plant
4) C.O.P. of the system.

Take the enthalpy at the end of isentropic compression =220 kJ/kg

The Properties of R-12 refrigerant are

Temp (°C)	Pressure (bar)	h_f (kJ/kg)	h_g (kJ/kg)	s_f (kJ/kg k)	s_g (kJ/kg k)
45	10.846	79.71	204.87	0.2878	0.6811
0	3.086	36.022	187.397	0.1418	0.6960

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