Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – SUMMER 2015

Subject Code: X71901 **Date: 08/05/2015**

Subject Name: Refrigeration and Air-Conditioning

Time: 02:30 pm - 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.**
4. **Use of student's own tables and charts are allowed.**

Q.1 **(a)** Explain the working of Vapour compression refrigeration system with the help of neat T-S and P-H diagram. **07**

State the advantages of vapour compression refrigeration system over air refrigeration system.

(b) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine (i) C.O.P of the cycle (ii) and Capacity of refrigerator if the fluid flow is at the rate of 5 kg/min. **07**

Data:

Pressure(bar)	Saturation temp. (K)	Enthalpy (kJ/kg)		Entropy(kJ/kgK)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

Q.2 **(a)** Explain Boot strap air refrigeration system with neat diagram. **07**

(b) The atmospheric air at pressure 1 bar and temperature -5^0 C is drawn in the cylinder of the compressor of a Bell-Coleman refrigerating machine. It is compressed isentropically to a pressure of 5 bar. In the cooler, the compressed air is cooled to 15^0C, pressure remaining the same. It is then expanded to a pressure of 1 bar in expansion cylinder, from where it is passed to cold chamber. Find (i) the work done per kg of air (ii) C.O.P of the plant. **07**

For air assume law for expansion $pv^{1.2}$= constant, law of compression $pv^{1.4}$= constant and specific heat of air at constant pressure = 1 kJ/kg K

OR

(b) Explain Steam jet refrigeration system with neat system diagram and T-S diagram. Also state its applications, advantages and limitations. **07**

Q.3 **(a)** Explain working of Simple Vapour Absorption Refrigeration System with neat sketch. **07**

State the function of (a)Absorber (b) Rectifier in the practical vapour absorption refrigeration cycle.

(b) Explain multistage refrigeration system with multiple evaporators at the same temperature with single compressor and expansion valve. **07**

OR

Q.3 **(a)** Write short note on (i) Shell and Tube Condenser (ii) Screw Compressor **07**

(b) Explain construction, working, advantages and disadvantages of Thermostatic Expansion valve with neat sketch. **07**

Q.4 **(a)** The following data relates to the office air conditioning plant having maximum seating capacity of 25 occupants: **07**

Outside design conditions: 34 C DBT, 28 C WBT

Inside design conditions: 24 DBT, 50% RH
Solar heat gain = 9120 W
Latent heat gain per occupant = 105 W
Sensible heat gain per occupant = 90 W
Lightening load = 2300 W
Sensible heat load from other sources = 11630 W
Infiltration load =14 m^3/min
Assuming 40% fresh air and 60% of recirculated air passing through the evaporator coil and the by-pass factor of 0.15, find the dew point temperature of the coil and the capacity of the plant.

(b) Explain Flywheel effect as applied to cooling load calculation with neat labeled diagram. **07**

OR

Q.4 **(a)** Classify different Air conditioning systems. Explain Summer Air conditioning system. **07**

(b) Explain the procedure for calculating cooling load due to infiltration air. **07**

Q.5 **(a)** Explain following terms briefly: **07**

(i) Dew point temperature (ii) Wet bulb temperature (iii) Specific humidity (iv) Relative humidity (v) Degree of saturation (vi) Comfort Air-conditioning (vii) Effective temperature.

(b) Compare Forward and Backward curved centrifugal fan. **07**

OR

Q.5 **(a)** Explain Velocity Reduction method of Duct design. State its advantages and disadvantages. **07**

(b) Attempt any TWO of the following **07**

(i) Give classification and desirable properties of ideal refrigerant
(ii) Explain Flooded type Evaporator
(iii)Explain Adiabatic Saturation process.
(iv)Write short note on air conditioning of a public building.

****