

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181901****Subject Name: Refrigeration and Air conditioning****Date: 10/05/2012****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 calculator, Psychrometric chart and p-h chart is permissible.

Q.1 (a) Explain the working of Vapour compression refrigeration system with the help of a neat sketch. Mention the advantages of vapour compression refrigeration system over air refrigeration system. **07**

(b) Explain the following terms briefly : **07**

- | | |
|---------------------------------|-------------------------|
| 1) Refrigerating effect | 5) Wet bulb temperature |
| 2) Dew point temperature | 6) Psychrometry |
| 3) Comfort Air conditioning | 7) Relative humidity |
| 4) Cooling and Dehumidification | |

Q.2 (a) An air refrigerator working on Bell coleman cycle takes in air at 1 bar and at a temperature of 10^0 C. The air is compressed to 5 bar abs. The same is cooled to 25^0 C in the cooler before expanding in the expansion cylinder to cold chamber pressure of 1 bar. The compression and expansion laws followed are $p v^{1.35} = C$ and $p v^{1.3} = C$ respectively. Determine C.O.P of the plant and net refrigeration effect per kg of air. **07**

Take $C_p = 1.009$ kJ/kg K and $R = 0.287$ kJ/kg K for air.

(b) State the principle of Steam jet refrigeration system. Explain the working of Steam jet refrigeration system. **07**

OR

(b) State main applications of Refrigeration. Explain Ice making plant with a suitable diagram. **07**

Q.3 (a) In a 15 TR ammonia refrigeration plant, the condensing temperature is 25^0 C and evaporating temperature -10^0 C. The refrigerant ammonia is sub-cooled by 5^0 C before passing through the throttle valve. The vapour leaving the evaporator is 0.97 dry. Find (1) Coefficient of performance and (2) power required. Use the following properties of ammonia :- **07**

Saturation temperature 0 C	Enthalpy, kJ/kg		Entropy, kJ/kg K		Specific heat, kJ/kg K	
	Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
25	298.9	1465.84	1.1242	5.0391	4.6	2.8
-10	135.37	1433.05	0.5443	5.4770	---	---

(b) Briefly explain construction and working of Practical vapour absorption refrigeration system. Also mention the advantages of this system. **07**

OR

Q.3 (a) Mention the limitations of Simple vapour compression refrigeration cycle. Briefly explain the working of Two stage compression with water **07**

intercooler and liquid sub-cooler employed for vapour compression system.

- (b) The atmospheric air at 30°C dry bulb temperature and 75 % relative humidity enters a cooling coil at the rate of $200\text{ m}^3/\text{min}$. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. Determine: 1. The temperature of air leaving the cooling coil; 2. The capacity of the cooling coil in tonnes of refrigeration 3. The sensible heat factor for the process. **07**

Q.4 (a) Classify air conditioning systems. Explain Central air conditioning system with a neat sketch. **07**

- (b) A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data: **07**
Outside conditions = 34°C DBT and 28°C WBT
Inside conditions = 24°C DBT and 50 % RH
Volume of air supplied = $0.4\text{ m}^3/\text{min}/\text{person}$
Sensible heat load in room = 125600 kJ/h
Latent heat load in the room = 42000 kJ/h
Find the sensible heat factor of the plant.

OR

Q.4 (a) Write note on : **08**

- (a) Shell and tube condenser
(b) Screw compressor

- (b) Describe with neat sketch Li-Br and water system. What are its limitations? **06**

Q.5 (a) Write short note on : **08**

- (a) Split air conditioner
(b) Sources of Heat load

- (b) Explain in brief the following : **06**
(1) Filters
(2) Humidifiers used in air conditioning systems.

OR

Q.5 (a) Attempt the following: **08**

- (1) What is Refrigerant? Name some important refrigerants. State the properties of sound refrigerant.
(2) State various evaporators in use. Compare Flooded and DX (dry expansion) type evaporators.

- (b) A circular duct of 40 cm is selected to carry air in an air conditioned space at a velocity of 440 m/min to keep the noise level at desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when (a) the velocity of air in two ducts is same, (b) the discharge rate of air in two ducts is same. **06**
