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**Question Paper Code : 57529**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Sixth Semester**

**Mechanical Engineering**

**ME 6002 – REFRIGERATION AND AIR CONDITIONING**

**(Regulations 2013)**

**Time : Three Hours**

**Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. Write the unit of refrigeration and define it.
2. What is the effect of ODP and GWP ?
3. What is the effect of Superheating in vapour compression refrigeration system ?
4. Mention the principal advantage of cascade refrigeration system.
5. List out the field of application of vortex tube refrigeration system.
6. What modifications are necessary in a simple vapour absorption refrigeration system in order to improve the performance of the system ?
7. What is a Psychrometer ?
8. What is humid specific heat ?
9. What are the purposes of automatic control ?
10. What is summer air conditioning ?

**PART – B (5 × 16 = 80 Marks)**

11. (a) (i) Explain the refrigerant nomenclature in detail. (8)  
(ii) What are the essential properties of a good refrigerant? (8)

**OR**

- (b) Differentiate between Physical and thermodynamic properties of a refrigerant. Explain which are more important properties giving specific examples. (10 + 6)

12. (a) A vapour compression refrigerator work between the temperature limits of  $-20\text{ }^{\circ}\text{C}$  and  $25\text{ }^{\circ}\text{C}$ . The refrigerant leaves the compressor in dry saturated state. If the liquid refrigerant is under cooled to  $20\text{ }^{\circ}\text{C}$  before entering the throttle valve, determine :
- (i) Work required to drive the compressor  
(ii) Refrigerating effect produced/kg of refrigerant.  
(iii) COP

Assume specific heat of the refrigerant as 1.15. The properties of the refrigerant are given below. (16)

Temperature $^{\circ}\text{C}$	Enthalpy, kJ/kg		Enthalpy, kJ/kg K	
	Liquid	Vapour	Liquid	Vapour
-20	327.4	1655.9	3.8416	9.09
25	536.3	1703.3	4.5956	8.50

- (b) Explain the working of the following with sketch.
- (i) Flooded Evaporator (8)  
(ii) Thermostatic Expansion valve (8)



13. (a) Explain the steam jet refrigeration system with neat sketch and obtain the formula for finding out the quantity of steam required per ton of refrigeration. (8 + 8)

OR

- (b) Explain the working principle of pulse tube refrigeration system. What are the fields of its application? (12 + 4)

14. (a) Explain the following in details :

- (i) Thermodynamic wet bulb temperature (5)
- (ii) Degree of saturation (5)
- (iii) Mixing of air streams (6)

OR

- (b) One kg of air at 20 °C DBT and 80% R.H is mixed with two kg of air at 30°C DBT and 10 °C dew point temperature. The mixed air is passed through a cooling coil with a rate of 200 m<sup>3</sup>/min. The temperature of air coming out of the coil is 15 °C DBT. Calculate

- (i) DBT and specific humidity of air after mixing
- (ii) cooling load on the cooling coil in TR. (16)

15. (a) Explain the following in details :

- (i) Any one method of air distribution system (5)
- (ii) Viscous Filter (5)
- (iii) Thermostat and Humidistat (6)

OR

- (b) An air-conditioning system is to be designed for a small restaurant when the following data is available. (16)

Heat flow through walls, roof and floor = 22,000 kJ/hr

Solar heat gain through glass = 7,000 kJ/hr

Equipment sensible heat gain = 10,500 kJ/hr

Equipment latent heat gain = 2500 kJ/hr

Amount of fresh air supplied = 1600 m<sup>3</sup>/hr

Infiltrated load = 400 m<sup>3</sup>/hr

Seating capacity of the hall = 50

Persons serving meals = 5

Outside design conditions 35 °C DBT and 26 °C WBT.

Inside design conditions 27 °C DBT and 55% R.H.

The temperature of air supplied to the dining hall should not fall below 17 °C.

Find the following

- (i) Amount of air delivered to the dining hall in m<sup>3</sup>/hr
- (ii) Percentage of re-circulated air
- (iii) Refrigeration load on the cooling coil in TR.
- (iv) ADP of the cooling coil and its bypass factor.