



Code No. : 5196/M

FACULTY OF ENGINEERING
B.E. 3/4 (Mech./Prod.) II Semester (Main) Examination, May/June 2012
REFRIGERATION AND AIR CONDITIONING

Time: 3 Hours]

[Max. Marks : 75

Note: 1) Answer *all* questions of Part A.

2) Answer *five* questions from Part B.

Note: 1) *Use of Psychrometric charts, Refrigeration tables and steam tables is permitted.*

2) *Missing data, if any, may suitably be assumed.*

PART – A

25 Marks

1. Classify refrigerants. 2
2. Sketch T-S graph of regenerative cooling system. 3
3. Explain sub-cooling and super heating in vapour compression refrigeration system. 2
4. Draw the T-S and P-H diagram of vapour compression refrigeration system when the refrigerant after compression is dry and saturated and after condensation is saturated liquid. 3
5. List some of the desirable properties of refrigerants. 2
6. Define cryogenics and mention some applications. 2
7. Define :
 - i) Dry bulb temperature.
 - ii) Relative humidity. 2
8. Explain Vasomotor and Sodomotor control of human body defence mechanism. 3
9. Define :
 - i) Sensible Heat Factor
 - ii) Room Sensible Heat Factor.
 - iii) Grand Sensible Heat Factor. 3
10. Explain the types of Filters used in air conditioning systems. 3



PART - B

50 Marks

11. Explain the working of simple air refrigeration system with the help of layout diagram and derive the expression for C.O.P.

10

12. A refrigerator works between -7°C and 27°C . The vapour is dry at the end of adiabatic compression. There is no undercooling and the evaporation is by throttle valve.

Determine :

- i) C.O.P.
- ii) Power of the compressor to remove 180 kJ/min

The properties of refrigerant are as under

| Temp $^{\circ}\text{C}$ | Enthalpy | | Entropy | |
|-------------------------|----------|--------|---------|--------|
| | Liquid | Latent | Liquid | Vapour |
| -7 | -30 | 1298 | -0.108 | 4.75 |
| 27 | 115 | 1173 | 427 | 4.33 |

10

13. a) Explain the working principle of electrolux refrigerator.

5

b) Discuss desirable properties of refrigerant and absorbents used in vapour absorption system

5

14. An air-water vapour mixture enters an adiabatic saturator at 28°C and leaves at 18°C , which is the adiabatic saturation temperature. The pressure remains constant at 1.0 bar. Determine the relative humidity and humidity ratio of the inlet mixture.

10

15. A hall is to be maintained at 20°C and 60% RH. When outdoor design condition are 40°C DBT and 26°C WBT. The sensible heat load in the hall is 70,000 kJ/hr and latent heat load is 22,000 kJ/hr. The infiltrated air is $30\text{ m}^3/\text{min}$. 60% of the total air required is recirculated and mixed with the conditioned air after the conditioner.



Find the following :

- i) The condition of air leaving the conditioner and before entering the hall.
- ii) Volume of fresh air passing through air conditioner.
- iii) By pass factor of conditioner coil.
- iv) Refrigeration load on conditioner coil in tons of refrigeration.
- v) Area of cooling coil required if the overall heat transfer coefficient is $50 \text{ w/m}^2\text{°C}$

Take ADP of cooling coil = 5°C .

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16. a) Explain the methods of food preservation.

4

b) Explain the concept of by pass factor and define by pass factor for cooling and heating coil.

6

17. a) Explain the working principle of steam jet refrigeration system.

6

b) Explain global warming.

4