

End Semester Examinations - 2015-16 Even Semester - May 2016

14ME2051 Refrigeration and Air Conditioning

Set A

Time : 3 hrs
Total Marks: 100

1. a. Derive the expression for COP of Bell-Coleman cycle. (10)
b. A dense air refrigeration machine works on the Bell-Coleman cycle with 10 TR capacity. The cooler pressure is 4.2 bar and refrigerator pressure is 1.4 bar. The air is cooled to temperature of 50°C in the cooler. The temperature of air at inlet to compressor is -20°C. Determine the COP of the system. (10)

OR
2. a. What are the advantages and disadvantages of using air as a refrigerant? (10)
b. A refrigerator working on Bell-Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10°C, compressed and then cooled to 30°C before entering the expansion cylinder. The expansion and compression follow polytropic process. Take $n=1.3$. Determine the COP of the system. (10)
3. a. Explain the working of vapour compression refrigeration system and draw the P-h and T-S diagrams. (10)
b. A Freon-12 compression system, operating at a condenser temperature of 40°C and an evaporator temperature of -5°C, develops 15 tons of refrigeration. Determine the actual COP of cycle and Carnot COP. (10)

OR
4. a. Write a short note on actual vapour compression refrigeration cycle. (10)
b. An ammonia ice plant operates between a condenser temperature of 35°C and an evaporator temperature of -15°C. It produces 10 tons of ice per day from water at 30°C to ice at -5°C. Assuming saturation cycle, determine the COP of the system. (10)
5. a. Compare vapour absorption and vapour compression refrigeration systems. State merits and demerits of each method. (10)
b. Write a short note on lithium bromide-water absorption cycle. (10)

OR
6. A sling psychrometer reads 40°C DBT and 28°C WBT. Calculate the following:
 - i) Specific humidity
 - ii) Relative humidity
 - iii) Vapour density in air
 - iv) Dew point temperature and
 - v) Enthalpy of mixture per kg of dry air. (20)
7. a. Describe factors affecting effective temperature. (10)
b. Draw a comfort chart and explain various quantities listed on it. (10)

OR
8. a. One kg of air at 40°C DBT and 50% RH is mixed with 2 kg of air at 20°C DBT and 20°C dew point temperature. Calculate the temperature and specific humidity of the mixture. (10)
b. Explain the summer air conditioning system with a sketch? (10)

9.

a. A air-conditioning system to be designed for a restaurant with the following data:

Outside design conditions = 40°C DBT, 28°C WBT

Inside design conditions = 25°C DBT, 50% R.H

Solar heat gain through walls, roof and floor = 2000 KJ/h

Solar heat gain through glass = 1800 KJ/h

Occupants = 25

Sensible heat gain per person = 200 KJ/h

Latent heat gain per person = 200 KJ/h

Internal lighting load = 15 lamps of 100 W and 10 fluorescent tubes of 80 W

Sensible heat gain from other sources = 40,000 KJ/h

Infiltrated air = $15\text{ m}^3/\text{min}$

If 25% of fresh air and 75% of recirculated air is mixed and passed through the conditioner coil,

Find, i) DPT of coil and ii) capacity of conditioning plant. Assume BPF = 0.2 (15) **(Compulsory)**

b. Write a short note on application of air-conditioning? (5) **(Compulsory)**

Wishing you All the Best
