

SECTION-B

- Q2 Write the differences between following :
- Refrigeration and Air Conditioning.
 - Industrial air conditioning and Comfort air conditioning.
- Q3 Write short notes on following :
- Need of alternatives to CFC's refrigerants.
 - Cryogenics and its applications.
- Q4 Draw a neat diagram of lithium Bromide water absorption refrigeration system and explain its working. Also discuss the advantages of using vapour absorption system (VAS) over vapour compression system (VCS).
- Q5 A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of -10°C and 45°C . At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C . Find the C.O.P of the refrigerator. The relevant properties of methyl chloride are as follow :
- | Saturation temperature in $^{\circ}\text{C}$ | Enthalpy in kJ/kg | | Entropy in kJ/kg K | |
|--|-------------------|--------|--------------------|--------|
| | Liquid | Vapour | Liquid | Vapour |
| -10 | 45.4 | 460.7 | 0.183 | 1.637 |
| 45 | 133.0 | 483.6 | 0.485 | 1.587 |
- Q6 Discuss in detail the role of ducts, dampers and air filters in air conditioning system. Also explain the various losses in the ducts of air conditioning system.

SECTION-C

- Q7 A dehumidifying spray washer is chosen to operate under the following conditions
- Inter air condition : 28°C DBT, 21°C WBT
- Outlet air condition : 10°C DBT, 6°C WBT
- Volume of air handled = 2000 cubic meter/minute
- The chilled water inlet and outlet temperatures are 7°C and 12°C respectively.
- Evaluate cooling load on the coil, water flow rate through the coil.

- Q8 A conference room for seating 100 persons is to be maintained at 22°C dry bulb temperature and 60% relative humidity. The outdoor conditions are 40°C dry bulb temperature and 27°C wet bulb temperature. The various loads in the auditorium are as follows:

Sensible and latent heat loads per person, 80 W and 50 W respectively; lights and fans, 15000 W; sensible heat gain through glass, walls, ceiling etc., 15000 W. The air infiltration is 20 m³/min and fresh air supply is 100 m³/min. Two-third of recirculated room air and one-third of fresh air are mixed before entering the cooling coil. The by-pass factor of the coil is 0.1.

Determine apparatus dew point, the grand total heat load and effective room sensible heat factor.

- Q9 An air-cooling system for a jet plane cockpit operates on the simple cycle. The cockpit is to be maintained at 25°C. The ambient air pressure and temperature are 0.35 bar and -15°C respectively. The pressure ratio of the jet compressor is 3. The plane speed is 1000 kilometers per hour. The pressure drop through the cooler coil is 0.1 bar. The pressure of the air leaving the cooling turbine is 1.06 bar and that in the cockpit is 1.01325 bar. The cockpit cooling load is 58.05 kW. Calculate :

- Stagnation temperature and pressure of the air entering the compressor.
- Mass flow rate of the air circulated.
- Volume handled by the compressor and expander.
- Net power delivered by the engine to the refrigeration unit.
- COP of the system.