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Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards)   (Sem.–7,8)
REFRIGERATION AND AIR CONDITIONING
Subject Code : BTME-802
Paper ID : [A3063]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
 1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
 2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
 3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q1   Write briefly :

(a) Differentiate between Refrigeration and cooling.

(b) Draw Bell Coleman cycle on PV and TS diagrams.

(c) Name the various components of a simple vapour compression system.

(d) What is the significance of intercooling in compound compression?

(e) Name the three fluids used in a three-fluid vapour absorption system.

(f) Write the applications of low temperature refrigeration.

(g) Define the terms: Relative Humidity, Dew point temperature.

(h) Draw heating with dehumidification process on psychometric chart.

(i) What do you understand by the term cooling load?

(j) Why the ducts are used in an air conditioning system?

SECTION-B

2. A cold storage is to be maintained at $-5°$ C while the surroundings are at $35°$ C. The heat leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual C.O.P. of the refrigeration plant is one third of an ideal plant working between the same temperatures. Find the power required to drive the plant.

3. Explain with the help of a neat schematic diagram and pressure-enthalpy diagram, the working of a refrigeration system having three evaporators at different temperatures with individual compressors and multiple expansion valves.

4. Draw a neat diagram of practical vapour absorption refrigeration system and explain the working of its basic components.

5. Sketch and explain a cascade refrigeration system. Draw cascade refrigeration cycle on temperature-entropy and pressure enthalpy diagrams.

6. Discuss briefly the different types of heat loads which have to be taken into account in order to estimate the total heat load of a large restaurant for summer air conditioning.

SECTION-C

7. An aircraft refrigeration plant has to handle a cabin load of 30 tonnes. The atmospheric temperature is 17°C. The atmospheric air is compressed to a pressure of 0.95 bar and temperature of 30°C due to ram action. This air is then further compressed in a compressor to 4.75 bar, cooled in a heat exchanger to 67°C, expanded in a turbine to 1 bar pressure and supplied to the cabin. The air leaves the cabin at a temperature of 27°C. The isentropic efficiencies of both compressor and turbine are 0.9. Calculate the mass of air circulated per minute and the C.O.P. For air $c_p = 1.004$ kJ/kgK and $c_p/c_v = 1.4$.

8. 39.6 m^3/min of a mixture of recirculated room air and outdoor air enters a cooling coil at 31°C dry bulb temperature and 18.5°C wet bulb temperature. The effective surface temperature of the coil is 4.4°C. The surface are of the coil is such as would give 12.5 kW of refrigeration with the given entering air state. Show the process on skeleton psychometric chart. Determine the dry and wet bulb temperatures of air leaving the coil and by-pass factor.

9. Write short notes on the following :

   a) Eco-friendly refrigerants and action plan to reduce ecological hazards.

   b) Central air conditioning plants.