QP Code : 2224

(3 Hours) [Total marks : 100

N.B.
1) Question No. 1 is compulsory.
2) Attempt **four** questions from remaining **six** questions.
3) Use of psychometric, refrigerant charts and tables. friction chart. steam tables are permitted.
4) Clearly mention the assumptions made if any.

1. a) Explain the working of simple vapour compression cycle with schematic and P-H diagrams. 6
   b) Explain the effect of suction pressure with the help of p-h diagram in Vapour compression system. 6
   c) Name the different types of air refrigeration system used for the cooling of the aircraft cabin. Draw bootstrap air refrigeration cycle with neat schematic and T-S diagram. 8

2. a) What is dry ice? How it is manufactured? Explain with neat sketch. 6
   b) Explain difference between vapour compression refrigeration system and vapour absorption refrigeration system. 4
   c) An air cooling system for a jet plane cock pit 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 km/hr. The air is passed through a heat exchanger after compression and cooled to its. original condition entering into the air jet. The pressure loss in heat exchanger is 0.1 bar. The pressure of air leaving the cooling turbine is 1.013 bar and is also the pressure in the cockpit. The cooling load in the cockpit is 70 KW. Determine-

   i) Mass flow rate of air circulated to the cabin.
   ii) Net power delivered to the refrigeration system.
   iii) The COP of the system. 10

3. a) A vapour compression system using R12 works between -15^0C and 35^0C as evaporator and condenser temperature resp. Using P-H chart determine:
   i) COP
   ii) Mass flow of refrigerant per TR
   iii) Piston displacement per TR using volumetric efficiency 80%
   iv) Heat rejected in the condenser per TR
   v) Ideal COP 12

   b) Compare Primary refrigerants with Secondary refrigerants 8

4. a) The following data refer to an air conditioning plant:

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Inside conditions: 24°C DBT, 55% RH
Outside conditions: 37°C DBT, 25°C WBT
Sensible heat gain= 13.6 KW
Latent heat gain= 8.25 KW

Return air is mixed with outdoor air before entering the coil in the ratio 3.5:1 and the return from the room is also mixed after cooling coil in the ratio 1:3.5 Coil BPF is 0.15. The air may be reheated if necessary before supplying to the conditioned room. Assuming the ADP=7°C. Determine: i)Supply air condition to the room. ii) Amount of fresh air supplied. iii) Cooling load.   14

    b) Explain cascade system of refrigeration   6

5. a) What is an effective temperature? Explain briefly effective temperature chart and comfort chart.   10

    b) What are the types of expansion valves? Explain the working of thermostatic expansion valve   10

6. a) What is aspect ratio? Discuss the different methods of duct design.   10

    b) Explain with neat schematic liquid to vapour heat exchanger used in VCR   10

7. Write short notes on **any four** of the following:-   20
    a) Controls used in Air Conditioning
    b) by- pass factor
    c) Cooling towers
    d) Defrosting
    e) Air washer

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.: B.E. (SEM. VII) (REV.-2007) (MECHANICAL ENGG.) (PROG.-T5317)

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Correction:

Q. No. 4 a)..... Assuming the ADP=7 °C.

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