QP Code : 29756

(OLD COURSE)
(3 Hours)

[Total Marks: 100]

N.B. (1) Question No. 1 is **compulsory**.
      (2) Attempts any **four** questions from remaining **six** questions.
      (3) Draw **neat sketches** wherever necessary.
      (4) Figures to the right indicate full marks.

1   (a) What is the difference between a refrigerator and a heat pump?   5
    (b) What do you mean by air cycle refrigeration? Why air is required as a refrigerant
    for aircraft refrigeration?   5
    (c) Explain the effect of suction pressure with the help of p-h diagram in Vapour
    compression system.   5
    (d) What do you mean by Psychometry? Define Absolute Humidity.   5

2. (a) What is dry ice? How it is manufactured? Explain with neat sketch.   5
   (b) What is the difference between vapour compression and Vapour absorption system? 5
      (c) A vapour compression refrigeration system operates between evaporating and
      condenser temperature of 258 K and 313 K respectievely. Calculate
      i)   Tonnage
      ii) Volume handled by compressor
      iii) COP and Heat transferred to condenser.
           The compressor power input is 10 KW. Refrigerant used is R_{22} and enthalpy at the
           end of isentropic compression is 287.07 KJ/Kg.

3. (a) Compare Primary refrigerants with Secondary refrigerants   8
       (b) A vapour compression system using R12 works between -150C and 350C 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

4. (a) Explain the reversed Carnot cycle and obtain an equation for the COP of the cycle. 8
    (b) A dense air refrigeration operates on a reversed Brayton cycle and is required for
        10 TR capacity. The cooler pressure is 4.2 bar and the refrigerator pressure is 1.4
        bar. The air is cooled in the cooler to a temperature of 50°C and the temperature
        of air at inlet to compressor is -20°C. Determine for the ideal cycle :
               (i)   COP
               (ii) Mass of air circulated per min.
               (iii) Theoretical piston displacement of compressor and expander
               (iv) Net Power per TR. Show the cycle on PV and TS diagram
                     Take $\gamma = 1.4$ and $C_p = 1KJ/Kg K$.   12

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

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6.(a) Define:
   (i) Dew point temperature
   (ii) Relative humidity
   (iii) Enthalpy
   (iv) Apparatus dew point temperature   8

(b)) The following data refer to an air conditioning plant:
   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.   12

7. (a) Write short notes on:- Manufacturing of dry   6
   (b) What is aspect ratio? Discuss the different methods of duct design.   7
   (c) Explain with neat schematic liquid to vapour heat exchanger used in VCR.   7