VASAVI COLLEGE OF ENGINEERING (*Autonomous*), HYDERABAD
B.E. (Mech. Engg.) III Year I-Semester (Main) Examinations, Nov./Dec.-2016
Refrigeration and Air Conditioning

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Define COP and unit of refrigeration.

2. Discuss the suitable refrigerants alternate to HCFC.

3. Indicate the vapor compression cycle on p-h plane for the following:
   i) When the vapor is dry and saturated at the end of compression
   ii) When vapor is wet after compression.

4. Draw the schematic diagram of a two stage cascade refrigeration system.

5. Find the maximum COP of a VAR system in which heating, cooling and refrigeration takes place at the temperatures of 105°C, 25°C and -5°C respectively.

6. Distinguish between refrigeration and cryogenics.

7. Represent the process of cooling and dehumidification on psychrometric chart.

8. Explain ASHARAE comfort chart.

9. Define RSHF.

10. Write the function of a humidifier and list methods of humidification.

Part-B (5 × 10 = 50 Marks)

11. a) In an open cycle air refrigeration system, air is drawn from a cold chamber at -5°C and [6] 1 bar and compressed to 6 bar. The air is then cooled to 20°C and then expanded to 1 bar. The compression and expansion follows the law $PV^{1.35}=C$, to produce 10TR. Find *i)* the mass flow rate of air to be circulated *ii)* COP *iii)* Power required to compress the air.

    b) Explain the working of boot strap refrigeration system without evaporative cooling with [4] the help of T-S diagram.

12. a) A refrigerating machine using R-12 as working fluid works between the temperatures [6] -18°C and 37°C. The enthalpy of the liquid at 37°C is 78kJ/kg. The enthalpies of R-12 entering and leaving the compressor are 200kJ/kg and 238kJ/kg respectively. The rate of circulation of refrigerant is 2kg/min and efficiency of compressor is 0.85. Determine
    i) Capacity of the plant in Tons of refrigeration
    ii) Power required to run the plant
    iii) COP of the plant.

    b) Explain the working of compound compression system with water inter cooler with a [4] neat sketch.

13. a) Describe the working of aqua-ammonia practical VAR system with a line diagram. [6]

    b) Explain the working of Claude system in cryogenics. [4]

14. a) Explain the Thermodynamics of human body and body defense. [4]

    b) 100 m³ of air per minute at 15°C DBT and 80% RH is heated until its temperature becomes [6] 22°C find *i)* Heat added to air in kJ/minute *ii)* RH of heated air and WBT. Take atmospheric pressure =1.013 bar.

15. a) Explain the working of packaged air conditioning unit(PACU).   [4]

    b) An air-conditioned plant is to be designed for the following conditions   [6]

        Outdoor conditions   = 9°C DBT and 8°C WBT

        Required indoor conditions   = 21°C DBT and 60%RH

        Amount of free air circulation = $0.5 m^3$/min/person

        Seating capacity of the office = 100.

The required condition is achieved first by heating and then by adiabatic humidifying. Find the heating capacity of the coil and the surface temperature required if the bypass factor of the coil is 0.32 and also the capacity of the humidifier.

16. a) What are desirable properties of refrigerants?   [5]

    b) Explain the effect of sub cooling and super heating on the performance of VCR system with the help of p-h plane.   [5]

17. Answer any *two* of the following:

    a) Working of pulse tube refrigeration system.   [5]

    b) Psychrometric chart and various psychrometric processes.   [5]

    c) Energy conservation techniques in an air conditioned building.   [5]

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