Code No: **PT41032**   **R13**   Set No. 1

IV B.Tech I Semester Supplementary Examinations, February/March - 2017
REFRIGERATION AND AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) What are the advantages of air refrigeration system?   [3]
    b) What are the sources of superheating in vapour compression system and its effect?   [4]
    c) Define critical pressure and temperature of refrigerants with its significance. [4]
    d) What are properties of ideal refrigerant used in adsorption cycle?   [4]
    e) What is the need for ventilation in air condition system?   [4]
    f) What are the factors which influence heat pump performance?   [3]

PART–B *(3x16 = 48 Marks)*

2. a) In a refrigeration system working on Bell Coleman cycle, air enters the cylinder at a pressure of 1 bar and 12°C. After undergoing isentropic compression to 8 bar, its cooled to a temperature of 25°C. The polytropic index for compression is 1.25 and later expanded to 1 bar. Determine (i) work done per kg of air (ii) refrigeration effect (iii) COP (iv) refrigerating capacity for a mass flow of 75 kg/h.   [8]
    b) Explain with relevant schematic and T-S diagram, working of regenerative air refrigeration cycle.   [8]

3. a) A vapor compression refrigeration system operating between pressure limits of 7.5 bar and 1.5 bar. The vapor enters the compressor at a temperature of - 8°C and liquid leaving the condenser is at 12°C. For a refrigerating effect of 2 kW, determine COP. Find the power rating of compressor motor considering a mechanical efficiency of 85%. The enthalpies at 1.5 bar and 7.5 bar are 1692 kJ/kg and 1919 kJ/kg respectively. Liquid enthalpy is 474 kJ/kg at the end of condensation.   [8]
    b) An ammonia refrigerator produces 30 tons of ice from and 0°C in a day of 24 hours. The temperature range in the compressor is from 25°C to -15°C. The vapour is dry saturated at the end of compression and expansion valve is used. Assume COP as 60% of theoretical and estimate power required to drive the compressor.   [8]

4. a) What are ecofriendly refrigerants and how can they safeguard our environment? [8]
    b) Why centrifugal compressors are preferable as compared to reciprocating compressors and what are their relative advantages?   [8]

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5. a) Explain with a simple neat sketch, construction and working of Lithium Bromide refrigeration system. [8]
   b) What are the advantages of adsorption refrigeration system over compression refrigeration system? [8]

6. a) In a air-conditioning plant 450 m^3/min of re-circulated air at 25°C DBT and 60% RH is mixed with 280 m^3/min of fresh air at 35°C DBT and 26°C WBT. The mixed air is further cooled to 20°C DBT maintaining specific humidity constant. Find the condition of air after mixing and capacity of cooling coil in tones of refrigeration. [8]
   b) Air at 26°C and 60% RH is required for industrial purpose when atmospheric conditions are 42°C DBT and 29°C WBT. The quantity of air required is 500 m^3/min. The required condition is achieved first by cooling and dehumidifying and then heating. If DPT of the cooling coil is 10°C, determine (i) cooling coil capacity and its by pass factor (ii) capacity of eliminator. [8]

7. a) What are the major advantages of steam heating system when used on a large scale? [8]
   b) Explain briefly the selection criteria for air filters in air conditioning system. [8]