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                                                                 PCME4402

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7th Semester Regular / Back Examination 2015-16
REFRIGERATION AND AIR CONDITIONING
Branch: MECH
Time: 3 Hours
Max marks: 70
Question Code: T193
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
(Refrigeration tables and charts are allowed in the examination hall)

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Q1   **Answer the following questions:**   **(2 x 10)**

    a) A refrigerator is having COP of 4.Determine T_{max}/T_{min}. If the device is used as heat pump, determine COP of the system.

    b) What is the main characteristic feature of air refrigeration system

    c) What are function of analyzers and rectifiers in vapor absorption system?

    d) Draw the h-S diagram for vapor compression system with multi evaporation

    e) Mention the types of expansion devices used in refrigeration systems.

    f) Differentiate between absorbents and adsorbents.

    g) 1 kg/s of air at 20°C is flowing through a heating coil having temperature of 50°C for winter air-conditioning system. The outlet temperature of air is 30°C. Find BPF and efficiency of the coil.

    h) A vapor absorption works on following temperature levels: Generator temperature=100°C, Condenser temperature=40°C, Evaporator temperature=10°C. Find the COP.

    i) How are the refrigerants numbered?

    j) What are .the effects of CFCs on environment? How do they affect the Ozone layer.

Q2 **a)** The following data pertain to an open air refrigeration system working   **(6)** between 10 bar and 1 bar is required to produce a cooling effect of 2000 kJ/min. Temperature of the air leaving the cold chamber is -5°C and leaving the cooler is 30°C. Neglecting losses and clearance in the compressor and expander, determine: (i)ass of air circulated per min (ii) compressor work, expander work (iii)COP

    b) Discuss the effect of the following on the performance of vapor   **(4)** compression system
i) Effect of suction pressure ii) Effect of delivery pressure iii) Effect of superheating iv) Effect of sub cooling.

Q3 A Freon-12 refrigerator producing a cooling effect of 20 kJ/s operates **(10)** on a simple vapor compression cycle with pressure limits of 1.5 bar and 9.5 bar. The vapor leaves the evaporator dry saturated and there is no undercooling. Determine the power required by the machine, rating of evaporator and COP.

If the compressor operates at 300 rpm and has a clearance volume of 3% of the stroke volume, determine the piston displacement of the compressor. For compressor assume that the expansion following the law $pv^{1.3}$=constant

Q4 a) Give the comparison between a vapour compression system and a **(5)** vapor compression system.

b) With neat sketches explain the Lithium bromide-water vapor absorption **(5)** system.

Q5 a) Describe multistage compression system with inter-cooling with neat **(5)** sketch and T-s, h-s diagrams

b) Explain with neat sketch, the working of Thermoelectric Refrigeration. **(5)** Define figure of merit.

Q6 a) Explain a neat diagram, the winter air conditioning system **(5)**
b) Air at 20°C,40% RH is mixed adiabatically with air at 40°C,40% RH in **(5)** the ratio of 1 kg of the former with 2 kg of the latter (on dry basis). Find the final condition of air.

Q7 a) It is required to design an air conditioning plant for an office room for **(10)** full winter air conditions.
Out door conditions=12°C DBT and 10°CWBT
Required conditions=20°C DBT and 60% RH
Amount of air circulation=0.3m^3/min/person
Seating capacity of the office=50
The required condition is achieved first by heating and then by adiabatic humidifying. Determine the following using psychrometric chart.
    (i) Heating capacity of coil in kW and surface temperature required, if the bypass factor is 0.2
    (ii) Capacity of the humidifier.

Q8 **Write short notes (any two)** **(5+5)**
a) Different types of condensers and evaporators
b) Comfort chart
c) Azeotropes