Code: R7320304

R07

B.Tech III Year II Semester (R07) Supplementary Examinations December/January 2015/2016

REFRIGERATION & AIR CONDITIONING

(Mechanical Engineering)

(For 2008 regular admitted batch only)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

Use of steam tables, P-H charts and Psychrometric charts is permitted in the examination hall

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1 (a) Explain briefly an air-refrigerator working on reversed Carnot cycle. Derive an expression for its C.O.P.
(b) Describe with a schematic diagram and draw the T-s representation of the processes of boot-strap evaporation type aircraft refrigeration system.

2 (a) What is sub-cooling and superheating? Explain with the help of diagram. Why is superheating considered to be good in certain cases?
(b) Establish how an actual cycle differs from a theoretical vapour compression cycle.

3 (a) Write short notes on Flooded evaporator and Shell-and-tube type evaporator.
(b) Explain the working of externally equalized Thermostatic expansion valve.

4 (a) Write a short note on Vapour absorption system.
(b) In a vapour absorption system heating, cooling and refrigeration takes place at temperatures of 197^{0}C, 17^{0}C and -3^{0}C respectively. Find the ideal C.O.P of the system.

5 (a) State the principle of a steam jet refrigeration system.
(b) Describe the working of a steam jet refrigeration system with the help of a neat sketch.

6 The outside air at 31^{0}C dry bulb temperature and 18.5^{0}C wet bulb temperature enters a cooling coil at the rate of 40 m^3/min. The effective surface temperature of the cooling coil is 4.5^{0}C and its cooling capacity is 12.5kW of refrigeration. Find:
(a) Dry bulb and wet bulb temperature of the air leaving the coil
(b) Enthalpy of air leaving the coil.
(c) By-pass factor of the coil.

7 The following data refer to an air-conditioning system of a cinema hall for winter conditions;
Outdoor conditions = 10^{0}C DBT and 60% RH
Required comfort conditions=22^{0}C DBT and 60% RH
Seating capacity = 2000
Amount of outdoor air supplied = 0.25 m^3/min
The required condition is achieved by heating humidifying and then again by heating. The air coming out of the humidifier is having 75% relative humidity. Find: (i) The heating capacity of the first heater in kW and the surface temperature of the coil if its by-pass factor is 0.3. (ii) The capacity of the humidifier in kg/h. (iii) The heating capacity of the second heater and its by-pass factor if the surface temperature of the coil is 25^{0}C.

8 In an air-conditioning plant, an air-handling unit supplies a total of 4500 m^3/min of air which comprises by mass 20 per cent of fresh air at 40^{0}C DBT and 27^{0}C WBT and 80 percent recirculated air at 25^{0}C DBT and 50% RH. The air leaves the cooling coil at 13^{0}C saturated. Calculate: (i) Total cooling load. (ii)Room heat gain.

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