EVENING

[Total No. of Questions: 09]

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Uni. Roll No. ....

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Program: B. Tech. (Batch 2018 onward)

Semester: 6th

Name of Subject: Refrigeration and air conditioning

Subject Code: PCME-116

Paper ID: 17253

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory.
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.
4) Refrigeration Table and Psychometric Charts is allowed.
5) Scientific calculator is allowed.

Part – A

[Marks: 02 each]

Q1.

a) What is DART?

b) State the factors that determine human comfort.

c) What is sensible heat factor?

d) A cold storage is to be maintained at -5°C while the surroundings are at 35°C. the heat leakage from the surroundings into the cold storage is estimated to be 29kW. The actual COP of the refrigerator is one third to an ideal COP between same temperatures. Find the power required to drive the plant.

e) What is meant by refrigeration effect?

f) Enlist any four essential properties of a good refrigerant.

Part – B

[Marks: 04 each]

Q2 Draw the line diagram and Ts chart for boot-strap air evaporative cooling system and drive the expression for COP of this system.

Q3 A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data:

Outside conditions	=	34°C DBT and 28°C WBT
Inside conditions	=	24°C DBT and 50% RH

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Volume of air supplied	=	0.4 m3/ min /person
Sensible heat load in room	=	125600 kJ/h
Latent heat load in the room	=	42000 kJ/h

Find the sensible heat factor of the plant.

Q4 What is effective temperature? Discuss the factors that affect the optimum effective temperature.

Q5 Differentiate between conventional and invertor refrigeration system?

Q6 A room 7 m x 4 m x 4 m is occupied by an air water vapor mixture at 38°C. The atmospheric pressure is 1 bar and the relative humidity is 70%. Determine the humidity ratio, dew point, mass of dry air and mass of water vapor.

Q7 Discuss the three stage compression with flash intercooler with neat schematic diagram.

Part – C   **[Marks: 12 each]**

Q8 An air conditioned space is maintained at 27°C dry bulb temperature and 50% relative humidity. The ambient conditions are 40°C dry bulb temperature and 27°C wet bulb temperature. The space has a sensible heat gain of 14kW. The air is supplied to the space at 7°C saturated. Calculate: 1) Mass of moist air supplied to the space in kg/h; 2) Latent heat gain of space in kW; and 3) Cooling load of air-washer in kW if 30% of air supplied to the space is fresh, the remainder being re-circulated.

OR

(a) What are inorganic refrigerants? Discuss in detail the properties and application of each inorganic refrigerant.

(b) One kg of air at 40°C dry bulb temperature and 50% relative humidity is mixed with 2kg of air at 20°C dry bulb temperature and 20°C dew point temperature. Calculate temperature and specific humidity of the mixture.

Q9 A conference room for seating 100 persons is to be maintained at 22°C dry bulb temperatures and 60% relative humidity. The outdoor conditions are 40°C dry bulb temperature and 27°C wet bulb temperature. The various loads in the auditorium are as follows:

Sensible and latent heat loads per person, 80W and 50W respectively, lights and fans, 15000W, sensible heat gain through glass, walls, ceiling etc., 15000W, The air infiltration is 20m3/min and fresh air supply is 100m3/min. Two-third of re-circulated

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room air and one third of fresh air are mixed before entering the cooling coil. The by-pass factor of the coil is 0.1. Determine apparatus dew point temperature, the grand total heat load and effective room sensible heat factor.

OR

(a) What is heating and humidification? Discuss in details with neat diagram. Also find the SHF for the heating and humidification.

(b) Describe the mechanism of a simple vapour compression refrigeration system.

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