24477

B. Tech. 7th Sem. (ME)

Examination – June, 2016
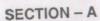
REFRIGERATION & AIR CONDITIONING

Paper : ME-403-F

Time : Three Hours]   [Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions in all. Question No. **1** is *compulsory* and select at least *one* question from each Section.

1. (a) What is the condensing medium used in evaporative condenser ?   2

    (b) What is the co-efficient of Performance ?   4

    (c) What are the secondary refrigerants ?   4

    (d) Give properties of aqua ammonia.   2

    (e) Define tone of refrigeration.   2

    (f) Define Relative humidity.   2

    (g) What are the differences between a Heat Engine, Refrigerator and Heat Pump ?   4

P. T. O.

Total amount of fresh air supplied = 1600 m³/h

Seating chairs for dining = 50

Employees serving the meals = 5

Sensible heat gain per person = 58W

Latent heat gain per sitting person = 44W

Latent heat gain per employee = 76W

Sensible heat added from meals = 0.17kW

Latent heat added from meals = 0.3kW

Motor power connected to fan = 7.6kW

If the fan is situated before the conditioner, then find the following :

(a) Amount of air delivered to the room in m³/h;

(b) Percentage of re-circulated air;

(c) Refrigeration load on the coil in tones of refrigeration; and

(d) Dew point temperature of the cooling coil and by-pass factor.   20

9. Explain the different types of condensers with neat sketch.   20

SECTION – A

2. What is Refrigerant ? How can you classify the refrigerants ? Discuss the various eco-friendly Refrigerants. Explain the concept of Cryogenics.   20

3. Derive an expression for C.O.P. of Bell-Coleman cycle and explain the Necessity of cooling the aeroplane.   20

SECTION – B

4. Explain Vapor absorption cycle with neat sketch.   20

5. Discuss the Properties of aqua ammonia and Steam Jet Refrigerating System.   20

SECTION – C

6. (a) Derive expression :   10

$$\phi = \frac{\mu}{1-(1-\mu)\dfrac{P_s}{P_b}}$$

(b) A sling psychrometer reads 40° C dry bulb temperature and 28° C wet bulb temperature. Calculate with the help of relations the following terms :   10

1. Specific humidity;   2. Relative humidity;
3. Vapor density in air; 4. Dew point temperature;
5. Enthalpy of mixture per kg of dry air.

7. (a) Explain in brief as to how the human body reacts to changes in temperature of environments. Also explain the effect of activities on the heat load calculation for comfort application.   10

(b) 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 14 kW. 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 the air washer in kW if 30 percent of the air supplied to the space is fresh, the remaining being re-circulated.   10

SECTION – D

8. An air conditioning system is designed for a restaurant when the following data is available :

Total heat flow through the walls, roof and floor = 6.2kW

Solar heat gain through glass = 2kW

Equipment sensible heat gain = 2.9kW

Equipment latent heat gain = 0.7kW

Total infiltration air = 400 m³/h

Outdoor conditions = 35° C DBT; 26° C WBT

Inside designed conditions = 27°C DBT; 55% RH

Minimum temperature of air supplied to room = 17° C DBT