C 3289

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

(Regulation 2004)

Mechanical Engineering

ME 1003 — REFRIGERATION AND AIR CONDITIONING

Time : Three hours   Maximum : 100 marks

Use of Refrigeration tables with ph charts and psychrometric charts is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the difference between Refrigerator and a heat pump?

2. What is the basic difference between vapour compression and vapour absorption refrigeration system?

3. Mention two important properties of a good refrigerant.

4. Name the refrigerant which is used in milk chilling plant.

5. Define the term Grand Sensible Heat Factor.

6. What is optimum effective temperature?

7. What type of load will the infiltrated air add to a space to be refrigerated?

8. What is the basic difference between Domestic and Commercial air conditioning system?

9. Mention two important requirements of the fresh air supplied to a conditioned space?

10. List two properties of a good thermal insulator used in air conditioning systems.

PART B — (5 × 16 = 80 marks)

11. (a) A simple saturation cycle using R12 is designed for a load 100 TR. The suction and discharge temperatures are 5° C and 50° C respectively. Calculate

    (i) The mass flow rate of refrigeration

    (ii) Refrigerating effect

    (iii) The COP and isentropic power

    (iv) The heat rejected in the condenser

    Assume the cycle to be dry and saturated.

Or

    (b) With the help of a neat sketch explain the working of Aqua Ammonia vapour absorption refrigeration system.

12. (a) With the help of a neat sketch explain the working of any four types of refrigerant evaporators.

Or

    (b) Explain the working of milk chilling plant, using a neat diagram

13. (a) 30 m³ of air at 15° C DBT and 13° C WBT are mixed with 12 m³ of air at 25° C DBT 18° C WBT. Assuming parametric pressure of one standard atmosphere, determine the DBT, WBT, UPT enthalpy, RH and Specific humidity of the resulting mixture.

Or

    (b) Write notes on the following :

    (i) Requirements of comfort air conditioning

    (ii) Comfort charts

    (iii) Factors governing optimum effective temperature.

(a) The following data were collected for designing an air conditioning halt.

OD conditions : 35° C DBT 27° C WBT

ID conditions : 27° C 21° C WBT

SH load of the hall : 1,60,000 kJ/hr

LH load of the hall : 60,000 kJ/hr

Infiltrated air : 25 m³/min

Cooling coil DPT : 15°C

Re circulated air from hall 60 % of total.

The quantity of re circulated air is mixed with the conditioned air after the cooling coil. Find the following

The condition of air after the cooling coil and before mixing the recirculated air

(i)   Condition of air entering the hall

(ii)   Weight of the fresh air entering the cooler

(iii)   Bypass factor of the cooling coil

(iv)   Capacity of the cooling coils in tons of refrigeration

Or

(b) A laboratory has the following heat gains

Sensible heat: 35 KW

Latent heat: 20 KW

The design conditions are as follows:

Outside: 40° C DB, 27° C WB

Inside: 22° C DB, 50% RH

The ventilation requirement is 80 cmm. A cooling coil with a bypass factor of 0.05 must be used. An apparatus dew point of 10° C must be maintained.

Determine

(i)   Amount of reheat required

(ii)   Supply air quantity'

(iii)   DBT and WBT of air entering apparatus

(iv)   DBT and WBT of air leaving apparatus

15. (a) With aid of neat sketch explain the working of any four types of air filters.

Or

(b) Explain the air conditioning systems used in the following applications

(i) Industry

(ii) Stores.

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