S6 ME

TED (10) – 4029

(REVISION — 2010)

Reg. No. .....

Signature .....

SIXTH SEMESTER DIPLOMA EXAMINATION IN MECHANICAL ENGINEERING — MARCH, 2015

REFRIGERATION AND AIR CONDITIONING

[*Time* : 3 hours

(Maximum marks : 100)

[*Note* :—1. Use of psychrometric chart allowed.

2. Missing data if any may be suitably assumed.]

PART—A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. What is sublimation ?
2. Define the term 'Ton of refrigeration'.
3. List the commonly used refrigerants.
4. Define psychrometry.
5. What do you mean by cooling load ? (5×2=10)

PART—B

(Maximum marks : 30)

II Answer *any five* of the following questions. Each question carries 6 marks.

1. What are the desirable properties of an ideal refrigerant ?
2. A reversed carnot cycle is used to deliver 62805 kJ/minute to heat the conditioned space. The operating temperature range is 4°C to 24°C. Determine power required to run the system.
3. What is hermetic compressor ?
4. Sketch the basic psychrometric process on a simple psychrometric chart.
5. Write short notes on degree of saturation and relative humidity.
6. Explain with neat sketch the working of winter air conditioning system.
7. Explain the classification of air conditioning systems. (5×6=30)

Marks

PART—C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT—I

III (a) Define COP of a refrigerator. 4

(b) Explain the use of accumulator and flash chamber in a vapour compression refrigeration system. 6

(c) Find the maximum possible COP of a refrigerated system which maintains a space at 5°C. The temperature of the room in which the system is installed is 35°C. 5

OR

IV (a) Draw a neat sketch of vapour compression refrigeration system and mark the high pressure side, low pressure side and different refrigerant piping lines. 5

(b) The temperature limits of an ammonia refrigerating system are 25°C and –10°C. If the gas is dry at the end of compression, calculate the coefficient of performance of the cycle assuming no under cooling of the liquid ammonia.

Use the following table for properties of ammonia.

Temperature °C	Liquid heat kJ/kg	Latent heat kJ/kg	Liquid entropy kJ/kgK
25	298.90	1166.94	1.1242
–10	135.37	1297.68	0.5443

10

UNIT—II

V (a) List the advantages of air cooled condensers. 4

(b) Draw the neat sketch of water cooler. 6

(c) Explain with line diagram, the working of an automatic expansion valve. 5

OR

VI (a) Explain the working of a simple absorption system with a flow diagram. 8

(b) Write short notes on pasteurization. 7

UNIT—III

VII (a) What is psychrometric chart ? 5

(b) 200 m^3 of an air per minute at 15°C DBT and 75% RH is heated until its temperature is 25°C without change its moisture content. Find RH of heated air, WBT of the heated air and heat added to air per minute. 10

OR

Marks

VIII (a) Write short notes on dry bulb temperature and wet bulb temperature. 5

(b) Atmospheric air at 15°C DBT and 30% RH passes through a furnace and through a humidifier. In such a way that the final dry bulb temperature is 32°C and 40% relative humidity. Determine heat and moisture added to the air, and sensible heat factor for the process. 10

UNIT—IV

IX (a) List the factors affecting comfort air conditioning. 4

(b) Explain with neat sketch the working of summer air conditioning system. 6

(c) Sketch a neat layout of central air conditioning plant. 5

OR

X (a) Explain the concept of effective temperature. 5

(b) A vegetable cold storage is to be designed with a maximum storage capacity of 350 tonnes. The following data is available:

Out door conditions = 34°C DBT and 28°C WBT
Inside conditions = 24°C DBT and 50% RH
Water content of the vegetables = 65%
Loss of water content = 0.015% per hour
Number of occupants = 15
Sensible heat gain through walls, floor and roof = 147000kJ/hour
Solar heat gain = 31500kJ/hour
Fresh air = 4000m^3/hour
Infiltrated air = 150m^3/hour
Sensible heat gain due to occupants = 252kJ/hour
Latent heat gain due to occupants = 210kJ/hour
Equipment sensible heat gain = 10500kJ/hour
Equipment latent heat gain = 2000kJ/hour

Calculate :

(a) Total room heat load.

(b) Total heat load.

Assume latent heat of vapourisation of water is 2500 kJ/kg.

Fresh air load :

(a) Sensible –10500kJ/hour

(b) Latent –12600kJ/hour. 10