PVP 19

Code: 19ME4601A

III B.Tech - II Semester – Regular Examinations – JUNE 2022

REFRIGERATION AND AIR CONDITIONING
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1. a) Draw a T-S diagram for Bell-Coleman Cycle.

b) List down the assumptions made for the analysis of Vapour compression refrigeration cycle.

c) What is the function of rectifier in Vapour absorption refrigeration system?

d) Show the humidification process on psychrometric chart.

e) What is ventilated air?

PART – B

UNIT – I

2. a) What is the necessity of refrigeration, also explain the unit of refrigeration. 6 M

b) Derive an expression for COP of Bell Coleman Cycle by representing the Cycle on T-S and P-V planes. 6 M

OR

3. a) Derive the expressions for the coefficient of performance of the simple air craft cycle with the help of P-V and T-S diagram. 6 M

b) An aircraft flying at an altitude of 8000 m, where the ambient air is at 0.35 bar pressure and 263 K temperature has a speed of 900 km/hr. The pressure ratio of the air compressor is 5. The cabin pressure is 1.01325 bar and the temperature is 27°C. Determine the power required by the aircraft for pressurization (excluding the ram work), additional power required for refrigeration, COP and refrigerating capacity on the basis of 1 kg/sec flow of air. 6 M

UNIT – II

4. a) In a Vapour compression refrigerator the working fluid is superheated at end of compression and is under cooled in the condenser before throttling. Show a working cycle on T-S diagram and also derive an expression of COP from that diagram. 6 M

b) Explain the effects of CFC refrigerant on environment. 6 M

OR

5. a) How do you classify the compressors used in the refrigeration system and also explain the working of any one compressor with neat sketch. 6 M

b) Explain the working of automatic expansion valve used in the refrigeration system with neat sketch. 6 M

UNIT-III

6. a) Differentiate between Vapour compression refrigeration system and Vapour absorption refrigeration system. 6 M

b) Explain the working of steam jet refrigeration system with neat diagram and mention its merits. 6 M

OR

7. a) Explain the working of Li-Br Vapour absorption refrigeration system. 6 M
   b) Explain the working of Thermo electric refrigeration. 6 M

UNIT – IV

8. a) Write short notes on the following : 6 M
   (i) RSHF
   (ii) GSHF
   (iii) Heating with humidification of air.
   b) Discuss the need for ventilation in an airconditioned room. 6 M

OR

9. The readings from sling psychrometer are as follows: DBT = 30°C, WBT = 20°C and barometer reading = 740 mm of Hg. 12 M
   Determine :
   (i) Specific humidity
   (ii) Relative humidity
   (iii) Degree of saturation
   (iv) Enthalpy.
   (Use refrigeration tables only).

UNIT – V

10. In an air-conditioning plant an air handling unit supplies-a total of 4000 m^3/min of dry air which comprises by mass 20 percent of fresh air at 39°C DBT and 26°C WBT and 80 percent recirculated air at 24°C DBT and 50% RH. The air leaves the cooling coil at 12°C saturated. 12 M
    Calculate the following :
    (i) Total cooling load
    (ii) Room heat gain.

OR

11. An air conditioning system is designed for industrial process for hot and wet summer conditions : 12 M

Outdoor conditions 30^0 DBT and 75% RH

Required conditions 22^0 DBT and 70% RH

Amount of free air circulated 200 m^3/min

Coil dew point temperature 14^0C

The required condition is achieved first by cooling and dehumidifying and then by heating.

Find the followings :

(i) Capacity of cooling coil in kW

(ii) Capacity of heating coil in kW and surface temperature of the heating coil if B.P.F. is 0.2.

(iii) Mass of water vapour removed by eliminator per hour