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BT-6/M-20 **36125**

REFRIGERATION AND AIR-CONDITIONING

Paper–ME-302 N

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. Assume any missing data suitably. Use of Refrigeration tables is allowed.

UNIT–I

1. A Carnot refrigerator requires 1.3 kW per tonne of refrigeration to maintain a region at low temperature of –38°C. Determine : (i) C.O.P. of Carnot refrigerator (ii) higher temperature of the cycle (iii) the heat delivered and C.O.P. when this device is used as heat pump. 15

2. A Bell-Coleman refrigerator operates between pressure limits of 1 bar and 8 bar. Air is drawn from the cold chamber at 9°C, compressed and then it is cooled to 29°C before entering the expansion cylinder. Expansion and compression follow the law $pv^{1.35}$ = constant. Calculate the theoretical C.O.P. of the system. 15

UNIT–II

3. In a standard vapour compression refrigeration cycle, operating between an evaporator temperature of –10°C and a condenser temperature of 40°C, the enthalpy of the refrigerant, F-12 at the end of compression is 220 kJ/kg. Show the cycle diagram on T-s plane. Calculate : (i) the

C.O.P. of the cycle, (ii) the refrigerating capacity and the compressor power assuming a refrigerant flow rate of 1 kg/min.

Extract of Freon-12 property table is given below :

t(°C)	p(MPa)	h_f(kJ/kg)	h_g(kJ/kg)
–10	0.2191	26.85	183.1
40	0.9607	74.53	203.1

15

4. Explain briefly simple vapour absorption system. Give the comparison between a vapour compression system and a vapour absorption system. 15

UNIT–III

5. Describe the following processes and show in psychometric chart : (i) Sensible heating (ii) Cooling and dehumidification (iii) heating and humidification (iv) heating and dehumidification. 15

6. It is required to design an air-conditioning plant for a small office room for following winter conditions :

Outdoor conditions : 14°C DBT and 10°C WBT

Required conditions : 20°C DBT and 60% RH

Amount of air circulated : 0.30 m^3/min/person

Seating capacity of office : 60

The required condition is achieved first by heating and then by adiabatic humidifying. Determine the following :

(a) Heating capacity of the coil in kW and the surface temperature required if bypass factor of coil is 0.4.

(b) The capacity of the humidifier. 15

UNIT–IV

7. (a) Write a short note on the design of summer air-conditioning system. 8

(b) Write a short note on 'solar radiation'. 7

8. (a) List the variables which are involved in the estimation of load. 7

(b) Explain the construction and working of evaporative condensers with the help of a neat sketch. 8