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7. What are the classification of air conditioning system and explain summer and winter air conditioning system with neat sketch. 15

Unit-IV

8. Classify refrigerator compressor and explain the working of reciprocating compressor with neat sketch. 15
9. (a) Explain thermostatic expansion valve. 7.5
(b) Explain shell and tube type evaporator. 7.5

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B.Tech. (ME)-PEC-II 7th Semester (G-Scheme)

Examination, December-2022

REFRIGERATION AND AIR CONDITIONING

Paper-PEC-ME-401-G

Time allowed : 3 hours] [Maximum marks : 75

Note : Question No. 1 is compulsory. Attempt total five questions selecting one question from each unit. All questions carry equal marks.

1. Compulsory Questions : 6×2.5

- (a) Desirable properties of refrigerant
(b) Apparatus dew point temperature
(c) What are the various types of evaporator?
(d) What are various methods of Air refrigeration?
(e) One tonne of refrigeration
(f) Secondary refrigerant

Unit-I

2. (a) Explain Reversed Carnot Cycle and Represent it on P-V and T-S Diagram. 7.5
(b) A refrigerating system operates on reversed Carnot cycle. The higher temperature is 35°C and lower temperature is -15°C. The capacity is to be 12 tonne.

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Determine (i) COP (ii) Heat rejected from the system per hour and (iii) Power required. 7.5

3. A simple air cooled system is used for an aeroplane having a load of 10 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. The pressure increases to 1.013 bar due to ramming. The temperature of the air is reduced by 50°C in the heat exchanger. The pressure in the cabin is 1.01 bar and the temperature of air leaving the cabin is 25°C. Determine:
- (i) Power required to take the load of cooling in the cabin; and (ii) C.O.P. of the system. Assume that all the expansions and compressions are isentropic. The pressure of the compressed air is 3.5 bar. 15

Unit-II

4. A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of 10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find the C.O.P. of the refrigerator. The relevant properties of methyl chloride are as follows : 15

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Saturation temperature in °C	Enthalpy in kJ/kg		Entropy in kJ/kg K	
	Liquid	Vapour	Liquid	Vapour
-10	45.4	460.7	0.183	1.637
45	133.0	483.6	0.485	1.587

5. Calculate the power needed to compress 20 kg/min of R-12 from saturated vapour at 1.4 bar to a condensing pressure of 10 bar by two-stage compression with intercooling by liquid refrigerant at 4 bar. Assume saturated liquid to leave the condenser and dry saturated vapours to leave the evaporator. Use the p-h chart and sketch the cycle on a skeleton p-h then label the values of enthalpy at salient points. 15

Unit-III

6. Following data refers to summer air-conditioning of a small office hall with capacity for 30 persons. Outside conditions : 34°C DBT, 28°C WBT inside design conditions : 24°C, 24% RH sensible and latent heat load in the room : 2100 kJ/min and 700 kJ/min volume of air supplied : 0.4 m³/min per person. Calculations for sensible heat factor for the air-conditioning plant 15

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