

SECTION-B

2. A Carnot refrigeration cycle absorbs heat at 270 K and rejects it at 300 K.
 - (i) Calculate the coefficient of performance,
 - (ii) If the cycle is absorbing 1130 kJ/min at 270 K, how many kJ of work is required per second?
 - (iii) If the Carnot heat pump operates between the same temperatures as the above refrigeration cycle, what is the coefficient of performance?
 - (iv) How many kJ/min will the heat pump deliver at 300 K if it absorbs 1130 kJ/min at 270 K.
3. Explain the working of Electrolux refrigeration system with neat sketch.
4. (a) Describe the refrigerating properties of ammonia for use in domestic and commercial type of refrigerating appliances.
(b) How will you assign number to the refrigerants methyl chloride and tetra-chloroethane?
5. 39.6 m³/min of a mixture of recirculated room air and outdoor air enters a cooling coil at 31°C dry bulb temperature and 18.5°C wet bulb temperature. The effective surface temperature of the coil is 4.4°C. The surface area of the coil is such as would give 12.5 kW of refrigeration with the given entering air state. Determine the dry and wet bulb temperatures of the air leaving the coil and the by-pass factor.
6. Explain the working of Steam Jet Refrigeration system with help of a diagram.

SECTION-C

7. A dense air machine operates on reversed Brayton cycle and is required for a capacity of 10 TR. The cooler pressure is 4.2 bar and the refrigerator pressure is 1.4 bar. The air is cooled in the cooler at a temperature of 50°C and the temperature of air at inlet to the compressor is -20°C. The expansion and compression follows the Law $p v^{1.4} = \text{constant}$, Determine :
 - (a) COP,
 - (b) mass of air circulated per minute,

- (c) theoretical piston displacement of compressor,
- (d) theoretical piston displacement of expander, and
- (e) net power per tonne of refrigeration.

Take C_p for air as 1 kJ/kg K

8. Using the following data, Find the COP if

- (a) there is no undercooling, and
- (b) the liquid is cooled by 5°C before expansion by throttling.

The vapour compression refrigeration system uses R-12 as refrigerant and the liquid evaporates in the evaporator at -15°C when the vapour is condensed at 10°C . Take specific heat at constant pressure for the superheated vapour as 0.64 kJ/kg K and that for liquid as 0.94 kJ/kg K.

Temp, °C	Enthalpy in kJ/kg		Specific Entropy in kK/kgK	
	Liquid	Vapour	Liquid	Vapour
-15	22.3	180.88	0.0904	0.7051
10	45.4	191.76	0.1750	0.6921

9. Write short notes on :
- (a) Package and central air conditioning plants
 - (b) Leak detection and charging of refrigerants