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Exam.Code:0943
Sub. Code: 7064

1128
B.E. (Mechanical Engineering)
Seventh Semester
MEC-701: Refrigeration and Air Conditioning

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

- I. Attempt the following:-
- a) Difference between Heat engine and refrigerator.
 - b) What is the effect of superheating of refrigerant on Refrigeration work in vapour compression refrigeration system?
 - c) List effect of evaporator pressure on COP of vapour compression refrigeration system.
 - d) Define specific humidity of air.
 - e) List different expansion devices used in refrigeration and air conditioning.(5x2)

UNIT - I

- II. An ammonia refrigeration plant produces 10 ton of ice per day at 263 K from water at 308 K. The refrigeration system operates between 257 K and 313 K. Vapour leaves evaporator at 273 K and condensate is sub cooled by 5 K. Determine flow rate of refrigerant, vapor sucked by compressor, its swept volume at 600 rpm, COP, refrigeration effect and work required. Take $C_{\text{water}} = 4.19 \text{ kJ/kg K}$, $C_{\text{ice}} = 2.18 \text{ kJ/kg K}$ and $L_{\text{ice}} = 335 \text{ kJ/kg}$. (10)
- III. Discuss in detail desirable thermodynamic, chemical and physical properties of an ideal refrigerant. (10)
- IV. A refrigerating machine of 6 tonnes capacity working on Bell-Coleman cycle has an upper limit of pressure of 5.2 bars. The pressure and temperature at the start of compression are 1 bar and 16°C respectively. The compressed air cooled at constant pressure at a temperature 41°C enters the expansion cylinder. Assuming both expansion and compression processes to be adiabatic with $\gamma = 1.4$, calculate: COP, air circulated per minute, power required to drive the unit, piston displacement of compressor and expander and bore of compressor and expansion cylinders when the unit runs at 240 rpm and is double acting with stroke length as 200 mm. Take $C_p = 1.003 \text{ kJ/kg K}$. (10)

P.T.O.

(2)

UNIT - II

- V. The moist air at 30 °C DBT and 50% RH enters a cooling coil at a rate of 300 m³/min and leaves the cooling coil at 10 °C in just saturated state. Find the amount of moisture addition or deletion, refrigeration required, final condition of air and its DPT. (10)
- VI. An office for seating 30 occupants is to be maintained at 22 °C DBT and 55% RH. The outdoor conditions are 36 °C DBT and 27 °C WBT. Various loads are: solar heat gain 8500 W, sensible heat gain/occupant 83 W, latent heat gain/occupant 100W, lighting load 2500 W, sensible heat load from other sources 12000 W, infiltration load 15 m³/min. If 40% fresh air and 60% re-circulated air is mixed & passed through the conditioner coil and bypass factor is 0.12 determine: DPT of the coil & the capacity of the conditioning plant in tons. (10)
- VII. a) Sketch and explain round the year central air conditioning plant and list various components required.
- b) What different types of expansion devices are used in air conditioning? Sketch and explain any two with applications. (5,5)

x-x-x