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Question Paper Code: 31779

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Elective

Mechanical Engineering

01UME913 - REFRIGERATION AND AIR CONDITIONING

(Regulation 2013)

(Psychrometric chart, Refrigeration table may be permitted)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. What do mean by a ton of refrigeration?
2. Define boot strap system.
3. List the types of evaporators.
4. What are the properties required for ideal refrigerant?
5. Indicate the adiabatic chemical dehumidification process in Psychrometry chart.
6. What is meant by Psychometric chart?
7. What is the comfortable air conditioning temperature and relative humidity?
8. List the different types of methods for determination of duct size.
9. In a vapour absorption system, the heat is supplied to NH₃ generator by condensing steam at 2 bar and 90% dry. The temperature in the refrigerator is to be maintained at - 5°C. Find the COP.
10. What are the methods for food freezing?

PART - B (5 x 16 = 80 Marks)

11. (a) One kg of air at a pressure of 1 bar and a temperature of 15°C is compressed to 5 bar. It is then cooled to 25°C in the cooler before entering the expansion cylinder. Determine theoretical COP of the plant and the net refrigerating effect per kg of air assuming compression and expansion as isentropic processes. Take $C_p=1kJ/kgK$ and $\gamma=1.4$. (16)

Or

- (b) In a cold air refrigeration working on Bell Coleman cycle, air is drawn into the cylinder of the compressor at pressure of one atmosphere and temperature of 5°C. It is compressed to 8 atmospheric pressure and then cooled to 25°C. If the expansion and compression follows law of $PV^{1.35}=C$, determine theoretical coefficient of performance. Take $C_p=1 kJ/kgK$ and $C_v=0.7128 kJ/kgK$. (16)
12. (a) Explain the natural draft type and mechanical draft type cooling towers with neat sketch. (16)

Or

- (b) Explain the flooded type and dry expansion type evaporators with neat sketch. (16)
13. (a) A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data
- Outside conditions=34°C DBT and 28°C WBT
Inside condition=24°C DBT and 50%RH
Volume of air supplied=0.4m³/min/person
Sensible heat load in room=125600kJ/hr
Latent heat load in the room=42000kJ/hr
Find the sensible heat factor of the plant. (16)

Or

- (b) A restaurant with a capacity of 100 persons is to be air conditioned with following conditions:
- Outside conditions:30°C DBT and 70% RH
Desired inside conditions:23°C DBT and 55% RH
Quantity of air supplied:0.5m³/min/person

The desired conditions are achieved by cooling, dehumidifying and then heating. Determine: Capacity of cooling coil, Capacity of heating coil, Amount of water removed by dehumidifier and By pass factor of heating coil. (16)

14. (a) Explain about centralized air condition system with neat sketch. List the advantages and disadvantages. (16)

Or

- (b) The two rectangular ducts handles $20m^3/s$ and $10m^3/s$ of air. The former is $1500 \times 1200 \text{ mm}$ and 20 m long while the later is 12 m long and the pressure drop is same as that of the former, using balanced pressure for these ducts, determine size of the second duct and total pressure drop. (16)

15. (a) (i) Explain about steam jet refrigeration system with neat sketch. (8)
(ii) Explain about thermoelectric refrigeration systems with neat sketch. (8)

Or

- (b) Explain about Ice plant lay out with neat sketch. List the advantages and disadvantages. (16)
