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Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Automobile Engineering/Mechanical Engineering

AU 010 704/ME 010 704—REFRIGERATION AND AIR CONDITIONING

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain the terms COP and relative COP of a refrigerator.
2. What are the different types of vapour compression cycles ?
3. What is an azeotrope ? Give some examples to indicate its importance.
4. Draw ideal and actual *p-v* diagram for a reciprocating compressor.
5. What is effective temperature ? What factors affect effective temperature ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the air refrigeration system working on reverse Carnot cycle.
7. Explain the function of a flash inter cooler provided in a compound vapour compression refrigeration system.
8. Give a comparison of vapour absorption and vapour compression systems.
9. Compare the performance of reciprocating and centrifugal compressors.
10. Distinguish between heat stroke, heat exhaustion and heat cramp.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Prove that the performance factor of a Bell-Coleman cycle refrigeration system is given by C.O.P $= T_2 / (T_3 - T_2)$. Where T_2 and T_3 are temperature of air at the inlet and discharge of compressor respectively.

Or

Turn over

12. An air refrigeration system used for food storage provides 25 TR. The temperature of air entering the compressor is at 7°C and the temperature at the exit of the cooler is 27°C. Find the COP of the cycle and power per ton of refrigeration required by the compressor. The quantity of air circulated in the system is 3000 kg / hr. The compression and expansion both follows the law $pv^{1.3}$ = constant. Take $\gamma = 1.4$ and Cp = 1 kJ / kg K for air.

13. With the help of schematic and p-h diagrams, explain the working of a two stage compression system with water inter cooler, liquid inter cooler and a liquid flash chamber.

Or

14. The following data refer to a three stage compression with three stage expansion valve and flash inter cooling.

    Condenser pressure = 12 bar, Evaporator pressure = 2 bar, flash intercooler pressures = 4 bar and 8 bar. Load on the evaporator =10 TR.

    Find the power required to drive he system and compare the COP of the system with that of simple saturation cycle working between the same overall pressures.

15. Derive an expression for the COP of an ideal vapour absorption system in terms of temperature T_G at which the heat is supplied O the generator, temperature T_E at which heat is absorbed in the evaporator and the temperature T_C at which the heat is discharged from the condenser and absorber.

Or

16. An ice plant working on ammonia as refrigerant works between overall pressure limits of 2.5 bar and 15 bar. It is filled with expansion valve with vapour extraction at 5 bar and 10 bar. The load on the plan is 10 TR. Find the circulation of the refrigerant through the condenser and the power required to drive the three compressors. Use p-h chart.

17. Give a comparison of flooded and non-flooded shell and tube type evaporators based on the capacity, condition of the vapour leaving the evaporator, heat transfer effectiveness, construction and control.

Or

18. What are the advantages of multi stage compressors ? Derive an expression for he work done in a two stage reciprocating compressor with inter cooler.

19. Explain an all weather air conditioning system with a suitable sketch and explain the working of the components in the circuit.

Or

20. A rectangular duct section of 500 mm × 350 mm size carries 75 m^3/ min of air having density of 1.15 kg / m^3. Determine the equivalent diameter of a circular duct if :

    (a) quantity of air carried in both the cases is same and ;

    (b) the velocity of air in both the cases is same. If $f = 0.01$ for sheet metal, find the pressure loss per 100 m length of duct.

(5 × 12 = 60 marks)