F 3443 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Seventh Semester

Branch : Mechanical Engineering/Automobile Engineering

REFRIGERATION AND AIR-CONDITIONING (M, U)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Use of Refrigeration and Airconditioning tables and charts and stream tables are permitted.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Show that COP of a neat pump is more than that of a refrigerator working between same temperature limits.
2. A carnot refrigerator extracts 500 kJ of heat per minute from a cold room which is maintained at –10°C and it is discharged to atmosphere which is at 35°C. Find the ideal power required to run be refrigerator.
3. What is subsiding and superheating ? Explain with help of diagrams.
4. Explain with the help of suitable diagram, multistage compression improves the COP of a system.
5. Explain the principle of vortex tube refrigeration system.
6. Explain the principle of magnetic refrigeration.
7. What do you meant by volumetric efficiency of a compressor ?
8. Explain the working of an Evaporative condenser.
9. Explain year round air-conditioning.
10. What do you mean by effective temperature and comfort chart ?

(10 × 4 = 40 marks)

Part B

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

11. The capacity of a refrigerator is 450 tonnes when working between – 15°C and 30°C. Find out the mass of ice produced in a day when water is supplied at 20°C. Also find out the minimum power required. Assume the machine to be working on carnot cycle. Take latent heat of ice as 335 kJ/kg.

Or

Turn over

12. Derive an expression for cop for an air-refrigerature system working on reversed Brayton cycle.

13. Describe any two methods of improving the COP of a simple saturation cycle with the help of neat diagrams.

Or

14. In a 12 tonnes refrigeration ammonia plant compression is carried out in two stages with water and flash intercooling and water sub cooling. Condenser pressure, evaporator pressure and flash intercooler pressures are 12 bar, 3 bar and 6 bar respectively. If the limiting temperature for intercooling and sub cooling is 20°C determine the following :—

(a) the COP of the plant.

(b) the power required for each compressor.

(c) the swept volume for each if the η_{vol} = 82%.

15. Describe the working of a steam jet refrigeration system with the help of a neat sketch.

Or

16. Differentiate between physical and thermodynamic properties of a refrigerant. Explain which are more important giving specific examples.

17. What is a cooling tower ? Explain briefly the natural draft cooling tower and mechanical draft cooling tower.

Or

18. Discuss the operation of a capillary tube in a refrigeration system. Explain briefly as to why capillary tube is preferred to other throttling devices in house hold refrigerator.

19. 40 m^3 of air at 35°C DBT and 50% RH is cooled to 25°C DBT maintaining its specific humidity constant. Determine :

(a) the relative humidity of cooled air.

(b) Heat removed from air.

Or

20. During adiabatic saturation process in air adiabatic saturator, in which atmospheric air enters at 0.965 bar, the WBT and DBT are 20°C and 31°C respectively. Determine :

(a) humidity ratio of the entering air.

(b) vapour pressure and relative humidity at 31°C

(c) Dew point temperature.

Take cp for air = 1.005 kJ/kgK.

(5 × 12 = 60 marks)