

G 1113

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Reg. No.....

Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2016**

**Seventh Semester**

Branch : Mechanical Engineering/Automobile Engineering

**REFRIGERATION AND AIR-CONDITIONING (MU)**

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

*Use of Refrigeration and AC charts and steam tables is permitted.*

**Part A**

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

1. Define the terms : C.O.P. and relative C.O.P.
2. With appropriate state space, explain the Bell-Coleman cycle.
3. Explain the working of multiple evaporation systems with a neat sketch.
4. What are the factors affecting Volumetric efficiency of a reciprocating compressor ?
5. Compare water cooled and air cooled condensers..
6. Explain the working of Vortex tube refrigeration system.
7. Explain the working principle of capillary tube.
8. State the advantages and limitations of Ammonia and Water refrigeration system.
9. Sketch any *four* psychrometric process on a psychrometric chart.
10. Explain summer air conditioning system.

(10 × 4 = 40 marks)

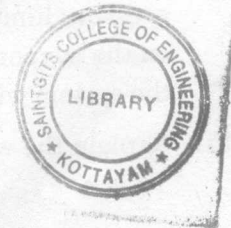
**Part B**

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

11. An aircraft moving with speed of 2000 km/h uses simple gas refrigeration cycle for air-conditioning. The ambient pressure and temperature are 0.35 bar and -10C (263K). The pressure ratio of the compressor is 4.5 and the heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and condenser are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25C. Determine the temperatures and pressures at all points of the cycle. Find the volume flow rate through the compressor inlet and expander outlet for 350 kW. For air,  $C_p = 1004\text{J/kgK}$ ,  $R = 287\text{J/kgK}$  and  $\gamma = 1.4$ .

Or

Turn over



12. Explain with P-h and T-s state space the working of a Vapor Compression Refrigeration system. Explain the effects of superheating and sub-cooling on the coefficient of performance of the system.
13. A single compressor using R-12 as refrigerant has three evaporators of capacity 30 TR, 20 TR and 10 TR (1TR = 3.5kW) .the temperature in the three evaporators are to be maintained at 263 K, 278 K, 283 K respectively. The system is provided with multiple expansion valves and back pressure valves. The condenser temperature is 40. The liquid refrigerant leaving the condenser is sub-cooled to 30 C.the vapours leaving the evaporators are dry and saturated. Assuming isentropic compression find : (a) the mass of refrigerant flowing through each evaporator ; (b) the power required to drive the compressor; and (c) the C.O.P. of the system.

Or

14. A three stage ammonia refrigeration system with flash inter-cooling operates between overall pressure limits of 2 bar and 12 bar. The flash inter-cooler pressures are 4 bar and 8 bar. If the load on the evaporator is 10 TR, find the power required to run the system and compare the C.O.P. of the system with that of simple saturation cycle working between the same overall pressure limits.
15. Explain the working principle of magnetic refrigeration and steam-jet refrigeration systems.

Or

16. Explain the working of the following refrigeration system : vapour absorption system.
17. Explain the working of following refrigeration system components : solenoid valve evaporative condensers and flooded evaporators.

(4 + 4 + 4 = 12 marks)

Or

18. (a) Derive an expression for clearance volumetric efficiency of compressor and simplify it for isentropic process. (6 marks)
- (b) On what factors does the volumetric efficiency of a compressor depend ? (6 marks)
19. For a sample of air having 22 C DBT, relative humidity 30 % at barometric pressure of 760 mm of Hg, calculate : vapour pressure, humidity ratio, vapour density, and enthalpy. Verify your results with psychrometric chart.

Or

20. Explain the working of a winter air conditioning system. How to convert this to a year round air conditioner ? Comment and draw the layout.

[5 × 12 = 60 marks]

