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A – 3797

Reg. No. :

Name :

**Seventh Semester B.Tech. Degree Examination, June 2016
(2008 Scheme)**

08-704 : REFRIGERATION AND AIR-CONDITIONING (M)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Use of Psychrometric chart and Refrigeration properties table **permitted**.

2) Answer **all** questions from Part A and **one full** question from **each** Module in Part B.

PART – A

1. What are the merits and demerits of air refrigeration system?
2. Which air refrigeration system will you prefer for cooling exceptionally high speed aircrafts? Why?
3. What are the limitations of reversed Carnot cycle? Explain.
4. What is the principle of producing cold by adiabatic demagnetization technique? Explain the concept of it.
5. What is a hermetically sealed compressor? Where is it used? What are its advantages?
6. Mention any four advantages of vapour absorption refrigeration system over vapour compression refrigeration system.
7. What do you mean by eco-friendly refrigerants? Name a few eco-friendly refrigerants.
8. Distinguish between RSHF and GSHF lines with appropriate sketches.
9. What is effective temperature of air and what is comfort chart?
10. What do you mean by ventilation air provided in air-conditioning systems? Explain its significance. **(4×10=40 Marks)**



P.T.O.



PART - B

Module - I

11. a) Describe with neat sketches the principle of working of Regenerative air refrigeration system and derive the expression for COP and power required. 10
- b) A refrigerating plant works between temperature limits of -5°C and 25°C . The working fluid ammonia has a dryness fraction of 0.62 at entry to compressor. If the machine has a relative coefficient of performance of 55%, calculate the amount of ice formed during a period of 24 hours. The ice is to be formed at 0°C from water at 15°C and 6.4 kg of ammonia is circulated per minute. Specific heat of water is 4.187 kJ/kg and latent heat of ice is 335 kJ/kg. Properties of NH_3 (datum -40°C).

| Temp $^{\circ}\text{C}$ | Liquid heat kJ/kg | Latent heat kJ/kg | Entropy of liquid kJ/kg K |
|-------------------------|-------------------|-------------------|---------------------------|
| 25 | 298.9 | 1167.1 | 1.124 |
| -5 | 158.2 | 1280.8 | 0.630 |

OR

12. a) A bootstrap cooling system of 9 tonnes refrigeration capacity is employed in an airplane. The ambient air temperature and pressure are 20°C and 0.86 bar respectively. The pressure of air increases from 0.86 bar to 1 bar due to ramming action of air. The pressure of air discharged from the main compressor is 3.2 bar. The discharge pressure of air from the auxiliary compressor is 4.2 bar. The isentropic efficiency of each of the compressor is 82 percent, while that of turbine is 86 percent. 45 percent of enthalpy of air discharged from the main compressor is removed in the first heat exchanger and 32 percent of the enthalpy of air discharged from the auxiliary compressor is removed in the second heat exchanger using rammed air. Assuming ramming action to be isentropic, the required cabin pressure of 0.92 bar and temperature of the air leaving the cabin not more than 21°C , find :
- The power required to operate the system and
 - COP of the system

Draw the schematic and temperature-entropy diagrams of the system

Take for air : $C_p = 1\text{kJ/kg K}$; $\gamma = 1.4$.



- b) Discuss the scheme of vapour compression refrigeration system using multistage compression and flash chamber intercooling. Find out the expression for mass flow rate through the evaporator, tonnes of refrigeration, total work of compression and COP of system. 10

Module - II

- 13. a) Describe the working of actual or practical NH₃-water vapour absorption refrigeration system with neat sketches. 10
- b) Explain the working of steam jet refrigeration system. 10

OR

- 14. a) Compare vapour absorption refrigeration system with vapour compression system. 10
- b) Describe the principle of working of Electrolux absorption refrigeration system. 10

Module - III

- 15. a) A mixture of dry air and water vapour is at a temperature of 22° C under a total pressure of 730 mm Hg. The dew point temperature is 15° C. Find :
 - i) Partial pressure of water vapour
 - ii) Relative humidity
 - iii) Specific humidity
 - iv) Enthalpy of air per kg of dry air
 - v) Specific volume of air per kg of dry air.
- b) Write short notes on the following :
 - i) Dew point temperature
 - ii) Adiabatic saturation process
 - iii) Degree of saturation
 - iv) BPF of cooling coil
 - v) Room ADP and coil ADP.



OR

- 16. a) 400 m³/min of recirculated air at 20° C DBT and 10° C DPT is to be mixed with 150 m³/min of fresh air at 35° C DBT and 45% RH. Determine the enthalpy, specific volume, humidity ratio and dew point temperature of the mixture. 10
- b) Explain the principle of working of a split air-conditioner with the help of neat sketch. How is it different from conventional window air-conditioner ? What are the advantages and disadvantages of split of air-conditioner over the conventional window air-conditioner ? Explain. 10