

III B. Tech II Semester Regular/Supplementary Examinations, October/November - 2020
REFRIGERATION AND AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **FOUR** Questions from **Part-B**
 4. Refrigeration and Psychrometric tables and charts allowed.
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PART -A

(14 Marks)

1. a) Write the Refrigeration needs of Air crafts. [2M]
- b) What is the effect of the sub cooling of liquid on the COP? [2M]
- c) What are the causes of ozone depletion? [2M]
- d) Under what situation in the steam jet refrigeration system recommended? [3M]
- e) What is the need for Ventilation? [3M]
- f) List out the drawbacks of axial flow fans. [2M]

PART -B

(56 Marks)

2. a) Give a brief description of an ideal cycle of air refrigeration. [6M]
- b) A refrigerating system working on the Bell-Coleman cycle receives air from the cold chamber at -5°C and compresses it from 1 bar to 4.5 bar. The compressed air is then cooled to a temperature of 37°C before it is expanded in the expander. Calculate the COP of the system when compression and expansion are: (i) isentropic and (ii) follow the law $p v^{1.25} = \text{constant}$. [8M]
3. A vapor compression refrigeration system operating between pressure limits of 7.5 bar and 1.5 bar. The vapor enters the compressor at a temperature of -8°C and the liquid leaving the condenser is at 12°C . For a refrigerating effect of 2 kW, determine COP. Find the power rating of the compressor motor considering a mechanical efficiency of 85%. The enthalpies at 1.5 bar and 7.5 bar are 1692 kJ/kg and 1919 kJ/kg respectively. Liquid enthalpy is 474 kJ/kg at the end of condensation. [14M]
4. a) What is refrigerant? Can water be used as a refrigerant? Explain the limitations. [7M]
- b) Why centrifugal compressors are preferable as compared to reciprocating compressors? What are their relative advantages? Explain. [7M]
5. a) Explain, with the help of a neat diagram, the working of the Ammonia-Water absorption system. [7M]
- b) Explain the working principle and components of the thermoelectric refrigerating system. [7M]
6. a) Explain the difference between comfort air-conditioning and industrial air-conditioning. [4M]
- b) A cinema hall of seating capacity 1500 persons have been provided with an air-conditioned plant with the following data: Outdoor conditions= 40°C DBT and 20°C WBT; Required indoor conditions= 20°C DBT and 60% RH; Amount of outdoor air supplied= $0.3 \text{ m}^3 / \text{min/person}$. If the required condition is achieved first by adiabatic humidifying and then by cooling, find: (i) The capacity of the cooling coil and surface temperature of the coil if the by-pass factor is 0.25; and (ii) The capacity of the humidifier and its efficiency. [10M]
7. What are the different types of fans used in air-conditioning systems? Discuss their applications with their relative advantages and disadvantages. [14M]

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