Code No: R1632033 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, February-2022

REFRIGERATION & 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**

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PART –A (14 Marks)

1. a) Define unit of refrigeration. [2M]
   b) Write the advantages of vapour compression refrigeration system. [2M]
   c) Classify refrigerants. [3M]
   d) What is thermoelectric effect? Write its applications. [3M]
   e) What is comfort air conditioning? [2M]
   f) What is the primary difference between Air cooler and Air conditioner? Where are they used? [2M]

PART –B (56 Marks)

2. a) Explain the working of Air refrigeration system. Write its advantages. [7M]
   b) A refrigerator working on Bell Coleman cycle operates between 1 bar and 10 bar. Air is drawn from cold chamber at 10^0C, compressed and then it is cooled to 30^0C before entering the expansion cylinder. The expansion and compression follows the law $pv^{1.3}$ = const. Determine the COP. Take γ = 1.4 and C_P = 1 kJ/kg^{0}C. [7M]

3. a) Explain the influence of various parameters on vapour compression refrigeration system performance. [7M]
   b) A refrigerating machine using R-12 as refrigerant operates between the pressures 2.5 bar and 9.0 bar. The compression is isentropic and there is not under cooling in the condenser. The vapour is dry and saturated condition at the beginning of the compression. Estimate the theoretical COP. If the actual COP is 0.65 of theoretical COP, calculate the net cooling produced per hour. The refrigerant flow is 5 Kg/min. The properties of refrigerant are : [7M]

Pressure (Bar)	Satu. temp. (°C)	Enthalpy (kJ/kg)		Entropy (kJ/kg K)
		Liquid	Vapour	Vapour
9.0	36	70.55	201.8	0.6836
2.5	–7	29.62	184.5	0.7001

Take specific heat of superheated vapour at 9 bar as 0.64 kJ/kg K.

4. a) Discuss about global warming. [4M]
   b) How condensers and evaporators are classified? Explain the working of any one condenser and evaporator with the help of neat sketch. [10M]
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5. a) Explain the working of NH_3 – water vapour absorption system. [7M]
   b) Discuss the ideal properties of refrigerant - absorbent combination. Give examples of refrigerant - absorbent combination. [7M]

6. a) An air-conditioned auditorium is to be maintained at 27^0C DBT and 60% RH. The ambient condition is 40^0C DBT and 30^0C WBT. The total sensible heat load is 100 000 kJ/h and total latent heat load is 40 000 kJ/h. 60% of the return air is re-circulated and mixed with 40% of makeup air after cooling coil. The condition of air leaving the cooling coil is at 18^0C. Determine: (i) RSHF, (ii) The condition of air entering the auditorium, (iii) The amount of make-up air, (iv) ADP and (v) BPF of cooling coil. [7M]
   b) What are the parameters considered for design of air conditioning of a room? [7M]

7. a) With the help of a circuit diagram explain the working of an air-conditioning cycle used for both heating and cooling. [7M]
   b) What is the necessity of Humidification in Air conditioning system? Explain the working of any humidifier. [7M]

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