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

III B. Tech II Semester Supplementary Examinations, April - 2021

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**

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PART –A (14 Marks)

1. a) Sketch Bell column cycle on P-V diagram. [2M]
   b) What are the disadvantages of wet compression? [2M]
   c) List out the properties of ideal refrigerant. [2M]
   d) Write the principle of thermoelectric refrigeration. [3M]
   e) Write any two major requirements of human comfort. [3M]
   f) What is the difference between grill and register used in air conditioning system? [2M]

PART –B (56 Marks)

2. a) A refrigerator working on Bell–Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10^0C. Air coming out of compressor is cooled to 30^0C before entering the expansion cylinder. Expansion and compression follow the law $p.v^{1.35}$ = constant. Determine C.O.P. of the system. Take $\gamma = 1.4$ and $C_p = 1$ kJ/kg –k for air. [8M]
   b) Explain Boot strap evaporative cooling air refrigeration system. [6M]

3. a) State the effects of suction pressure and discharge pressure on performance of vapour compression system. [6M]
   b) A simple saturation cycle using F12 is designed for taking a load of 10 tons. The refrigerator and ambient temperatures are -1^0C and 30^0C respectively. A minimum temperature difference of 5^0C is required in evaporator and condenser for heat transfer. Find: i) mass flow rate through the system; ii) power required in kw; iii) cylinder dimensions assuming L/D=1.2 for single cylinder, single acting compressor if it runs at 300 r.p.m. with volumetric efficiency = 0.9. [8M]

4. a) What is an azeotrope? Give some examples to indicate its importance. [7M]
   b) Explain why refrigerant R22 cannot be used with Hermetically sealed compressors? [7M]

5. a) List out the merits and demerits of thermo-electric refrigeration system over other refrigeration systems. What are the major fields of its applications? [7M]
   b) With a neat diagram, explain the working of Vortex tube refrigerator. [7M]

6. a) Define room sensible heat factor. How room sensible heat factor line is drawn on the psychrometric chart? [6M]
   b) The air at 35^0C DBT and 25^0C WBT is passed through a cooling coil at the rate of 280 m^3/min. The air leaves the cooling coil at 26.5^0C DBT and 50% relative humidity. Find: i) Capacity of the cooling coil in tonnes of refrigeration; ii) Wet bulb temperature of the leaving air; iii) Water vapor removed per minute; iv) Sensible heat factor. [8M]

7. a) Suggest the different constructional features used in heat pump to improve the overall EPR. [7M]
   b) Describe a centrifugal fan with the help of a neat sketch. [7M]

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