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Total No. of Questions : 09

B.Tech (ME) (Sem.-6)

REFRIGERATION AND AIR CONDITIONING

Subject Code : ME-304

M.Code : 59057

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Write briefly :

- Define ton of refrigeration.
- Define COP.
- Differentiate between open and closed air refrigeration systems.
- Enumerate properties of refrigerants.
- Define secondary refrigerant.
- What are disadvantages of HCFCs?
- Enumerate the principle of vapour absorption refrigeration system.
- Differentiate between DBT and WBT.
- Show the cooling and dehumidification process on psychometric chart.
- Define human comfort.

SECTION-B

- Q2 In a Bell Coleman refrigeration cycle, air is drawn from cold chamber at 1 bar and compressed to 6 bar in the compressor. The compression and expansion indices are 1.25 and 1.30 respectively. Determine the COP and Tonnage of the unit for an air flow rate of 0.5 kg/sec. Neglect the clearance volume and take temperatures at the beginning of compression and expansion to be 7 °C and 37 °C respectively.

- Q3 Explain the desirable properties of common refrigerant used in refrigeration and air conditioning systems.
- Q4 Moist air at standard atmospheric pressure is passed over a cooling coil. The inlet state of the air is 30°C DBT, 50% R.H. while the exit state is 15°C DBT and 80% R.H. Show the process on the psychrometric chart and determine amount of moisture and heat removed per kg of dry air.
- Q5 With the help of a neat sketch, explain the working of ammonia - water vapour absorption refrigeration systems.
- Q6 The following data refer to summer air-conditioning of a building: Outside design conditions: 43°C DBT & 27°C WBT, Inside design conditions: 25°C DBT & 50% R.H, Room sensible heat gain: 84000 kJ/hr, Room latent heat gain: 21000 kJ/hr. Bypass factor of cooling coil used: 0.2, The return air from the room is mixed with the outside air before entry to cooling coil in the ration of 4:1. Determine apparatus dew point of the cooling coil, entry & exit conditions of air for cooling coil, fresh air mass flow rate, and refrigeration load on the cooling coil.

SECTION-C

- Q7 a) A Carnot refrigerator requires 1.25 kW/ TR to maintain a region at low temperature of -40°C . Determine COP, higher temperature of cycle, heat rejected in kJ/min. Also calculate the heat delivered and COP if this device is used as heat pump.
- b) A freon -22 refrigeration plant working between the temperature limits of 5°C & 40°C produces refrigeration capacity of 40 TR. What would be its capacity for food freezing for which the evaporator temperature is to be maintained at -35°C ?
- Q8 a) With the help of a neat sketch, explain the construction and working of steam jet refrigeration system.
- b) Explain industrial and comfort air conditioning and also distinguish between them.
- Q9 a) A three-stage, 10-ton ammonia refrigeration system operates between the overall pressure limits of 2 bar and 12 bar with flash inter-cooling. The flash inter-cooling pressures are 4 bar and 8 bar. Find: Refrigerant flow rate through evaporator and the intercoolers; the power required to run the system. Compare the COP of the system with that of simple saturation cycle working between same overall pressure limits.
- b) Explain the construction and working of shell and tube evaporator valve giving a neat sketch.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.