

Roll No.

Total No. of Pages : 03

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B.Tech. (ME) (Sem-6)
REFRIGERATION AND AIR CONDITIONING

Subject Code : BTME601-18

M.Code : 79650

Date of Examination : 23-06-2023

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 :

- a) What do you understand by COP of a refrigeration system?
- b) Define energy performance ratio.
- c) Explain the effect of sub-cooling on COP of vapour compression refrigeration system. Would you desire large sub-cooling and why?
- d) What do you understand by multistage compression and why it is required in a system when the difference between the evaporator and condenser pressures is large?
- e) Why CFC refrigerants needs to be phased out?
- f) Differentiate between Azeotropes and Zeotropes.
- g) What do you understand by hermetically sealed compressors and what are its main advantages over ordinary coupled units?

- h) What is air conditioning and what is the basic difference between refrigeration and air conditioning?
- i) What is the difference between wet bulb temperature and thermodynamic wet bulb temperature?
- j) Enumerate the factors which affect effective temperature.

SECTION-B

2. What is the importance of refrigeration and which are the different methods of producing refrigeration? Also, define the terms and units of refrigeration.
3. In a simple vapour compression refrigeration system using R-12 as refrigerant, the evaporator and condenser temperatures are -10°C and 35°C respectively. If the capacity of the system is 15 tons and the compression is isentropic, calculate the following with the help of P-H chart for R-12:
 - a) Mass of refrigerant to be circulated
 - b) Power required in the compressor
 - c) Total heat rejected in the condenser
 - d) C.O.P. of the cycle. Also calculate the Carnot C.O.P. and show the percentage difference between the two. Draw the cycle on P-H chart for R-12.
4. Draw a neat diagram of lithium bromide water absorption system and explain its working in major field of applications of this system.
5. List the commonly used refrigerants in practice and explain in detail, desirable chemical properties of refrigerants.
6. The atmospheric air at 30°C dry bulb temperature and 75 % relative humidity enters a cooling coil at the rate of $200\text{m}^3/\text{min}$. The coil dew point temperature is 14°C and the bypass factor of the coil is 0.1. Determine: The temperature of air leaving the cooling coil; The capacity of the cooling coil in tonnes of refrigeration; and The sensible heat factor for the process.

SECTION-C

7. a) Explain the working principal and construction of Shell and Tube evaporator with the help of a neat sketch.
b) A Two stage ammonia refrigeration system operates between overall pressure limits of 15 bar and 2 bar respectively. The liquid is sub-cooled to 30°C . The temperature of desuper-heated vapour leaving the water intercooler is also 30°C . The flash chamber separates the dry vapour at 5 bar pressure. The liquid refrigerant then expands to 2 bar, the evaporator pressure. The load on the evaporator is 50 kW. Calculate i) Mass flow rate in different lines; ii) Power.
8. Following data is available for an air conditioning system comprising of filter, cooling coil, fan and distribution system using only fresh air for the purpose of maintaining comfort conditions in summer. RSH = 11.63 KW, RLH = 2.33 KW. Outside design condition: 28°C DBT, 20°C WBT. Inside design condition: 21°C DBT, 50% RH. Temperature of air entering the room = 11°C . Calculate RSHF, Coil bypass factor, Rate of flow of air kg/hr., Load on cooling coil, Coil ADP.
9. a) Explain the process of leak detection and charging of refrigeration of refrigeration systems.
b) Explain in brief, the concept of thermal analysis of human body, being used for comfort air conditioning. Also give the concept of effective temperature & comfort chart, in brief.

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.