Total No. of Questions : 10]

SEAT No. :

P2929

[Total No. of Pages : 3

[5669]-518

T.E. (Mechanical)

REFRIGERATION & AIR CONDITIONING

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All question are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary and mention it clearly.***
4) ***Use of steam table and psychrometric chart is allowed.***

Q1) a) Explain automotive air conditioning with its components and their function in brief. **[4]**

b) Write any four eco- friendly refrigerants with their chemical formula and designation. **[6]**

OR

Q2) a) Explain aqua ammonia vapour absorption refrigeration system with schematic diagram. **[4]**

b) An ideal vapour compression refrigerator uses methyl chloride (R40) as a refrigerant and operates between temperature limits of —10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. There is no under-cooling. Find the COP of the refrigerator. Take C_{PV} = 1.09 kJ/kg.K Draw p-h diagram of the cycle. **[6]**

The relevant properties of methyl chloride(R40) are as follows:

Sat. Temp	h_f	h_g	s_f	s_g
^{0}C	kJ/kg	kJ/kg	kJ/kg.K	kJ/kg.K
–10	45.38	460.76	0.183	1.762
45	132.98	483.6	0.485	1.587

P.T.O.

Q3) a) Compare vapour compression refrigeration system and vapour absorption system on any four criterion. **[4]**

b) In an absorption type refrigerator, the heat is supplied generator by condensing steam at 1.6 bar dry and saturated. The refrigeration temperature is –5°C. Condensation takes place at 30°C. Find maximum possible COP of the system.

If the refrigeration load is 150 TR and actual COP is 80% of maximum COP, calculate the mass of steam required per hour.

Use T_{sat} 113.3°C, h_{fg} 2220.9 kJ/kg at 1.6 bar **[6]**

OR

Q4) a) Draw schematic and p-h diagram cascade refrigeration system and explain its working. **[6]**

b) Why is flash gas intercooling is used in multistage compression. Explain its any two advantages. **[4]**

Q5) a) Define specific humidity, relative humidity and by-pass factor. **[6]**

b) The pressure of the air entering and leaving the adiabatic saturator is 1 bar. The air enters at 30°C and leaves as saturated air at 20°C. the specific humidity of entering steam of air is 0.0107 kg/kg of dry air. Calculate the specific humidity, relative humidity of exit the air- vapour mixture. **[10]**

OR

Q6) a) Write a note on indoor air quality requirement. **[4]**

b) What is infiltration? **[2]**

c) The atmospheric air at 25°C DBT and 12°C WBT is flowing at a rate of 100 m^3/min through a duct. The dry saturated steam at 100°C is injected into the air stream at a rate of 72 kg/h. Calculate the specific humidity, DBT, WBT, relative humidity and enthalpy of air leaving the duct. Show the process on psychrometric chart. **[10]**

Q7) a) Explain with neat sketch winter air conditioning system. **[6]**

b) Explain with neat sketch capillary tube. **[6]**

c) Explain with neat sketch working of thermostat. **[6]**

OR

Q8) a) Explain variable air volume system. State any two advantages over constant air volume system. **[6]**

b) Explain with neat sketch water cooled condenser. **[6]**

c) Draw p-v diagram of single acting single stage reciprocating compressor and explain its working in brief. **[6]**

Q9) a) Explain any two duct shapes with sketches and list any four duct materials. **[6]**

b) A rectangular duct, 800mm x 550mm size carries $5m^3/s$ of air having density 1.15 kg/m^3. Determine equivalent diameter of circular duct if a) Air flow is same. b) Air velocity is same. Further find pressure loss per 100 m for F = 0.001. Also calculate total pressure required at inlet to the duct to maintain the same flow, and air power required. **[10]**

OR

Q10)a) Explain any two types of filters used in air conditioning system. **[4]**

b) Explain any two types of supply air outlets with suitable diagrams. **[6]**

i) Grille outlets

ii) Ceiling diffuser outlets

iii) Slot diffuser outlets

c) Explain equal friction method of duct design. **[6]**

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