

Total No. of Questions : 10]

SEAT No. :

P4268

[Total No. of Pages : 5

[5353]-518

T.E. (Mechanical) (Semester - II)

REFRIGERATION & AIR CONDITIONING

(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary and mention it clearly.
- 4) Use of steam table is allowed.

- Q1) a) Explain commercial refrigeration for dairy products. [6]
b) Explain chemical properties of refrigerants. [4]

OR

- Q2) a) Compare vapour compression and vapour absorption refrigeration system. [4]
b) A vapour compression refrigerator of 1 TR capacity works between the pressure of 5.3 bar and 2.1 bar. The vapour is superheated by 5°C before entering the compressor and superheated to 37°C at the end of compression. Find the COP of the plant and refrigerant mass flow rate. Take C_p of vapour 0.63 kJ/kgK. [6]

| Sat. Pressure | Sat. Temp. | h_r | h_{fg} |
|---------------|------------|-------|----------|
| Bar | °C | kJ/kg | kJ/kg |
| 5.3 | 15.5 | 56.15 | 144.9 |
| 2.1 | -14 | 25.12 | 158.7 |

- Q3) a) Define : EER, SEER, IPLV and NPLV. [4]
b) Calculate percentage change in COP of the vapour absorption system when the generator temperature changes from 150°C to 200°C and refrigeration temperature changes from -20°C to -40°C. Condensation temperature remains same as 30°C. [6]

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OR

- Q4)** a) Derive equation of COP for the two stage compression with flash gas removal and liquid intercooler with schematic and P-h diagram. [8]
- b) Mention any two applications of cryogenics. [2]
- Q5)** a) Explain air washer and possible psychometric processes with it. [6]
- b) A mixture of dry air and water vapour is at a temperature of 21°C under a total pressure of 736 mm Hg. The dew point temperature is 15°C . Find: [10]
- Partial pressure of water vapour
 - Relative humidity
 - Humidity ratio
 - Enthalpy of air per kg of dry air
 - Specific volume of dry air per kg of dry air.

OR

- Q6)** a) Explain thermodynamic mechanism of human body. [6]
- b) A commercial shop has following loads:
- Room sensible heat : 58.15 kW
- Room latent heat : 14.54 kW
- The summer outside and inside design conditions are :
- Outside: 40°C DBT, 27°C WBT
- Inside: 25°C DBT, 50% RH
- 70 m^3/min of ventilation air is used. Determine the following if the bypass factor of the cooling coil is 0.15. [10]
- Ventilation load
 - Grand total heat
 - Grand sensible heat factor
 - Effective room sensible heat factor
 - Apparatus dew point

- Q7)** a) Explain with neat sketch winter air conditioning system. [6]
 b) Explain with neat sketch air water system. [6]
 c) Explain with neat sketch working of constant superheat expansion valve. [6]

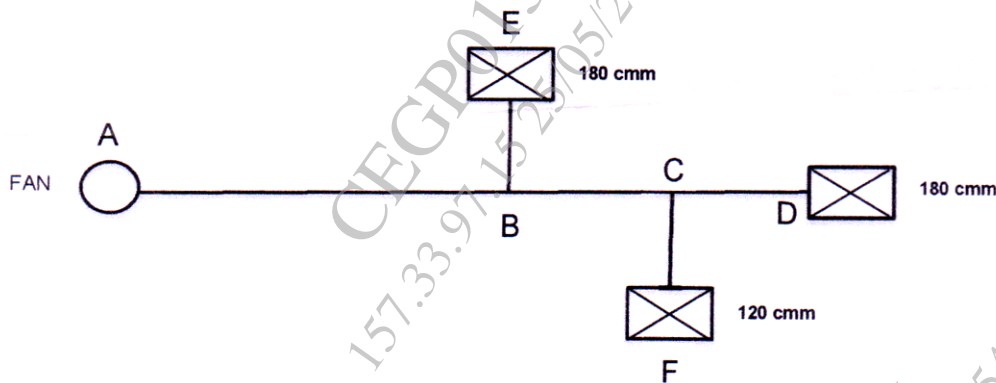
OR

- Q8)** a) Explain with neat sketch central air conditioning system. [6]
 b) Explain with neat sketch working of constant pressure expansion valve. [6]
 c) Explain with neat sketch scroll compressor. [6]

- Q9)** a) Derive an expression for equivalent diameter of circular duct corresponding to a rectangular duct of side a and b for same pressure loss per unit length when the discharge is same and when velocity is same. [8]

- b) Using equal Friction method, determine the duct diameter and velocity for section AB, BD and BC.

Assume velocity in the main duct AB = 600m/min. also calculate maximum pressure drop in the duct system. Distance AB = 40m, BE = 10m, CF = 10m, BD = 40m. [8]



OR

- Q10)** a) A circular duct diameter 0.3m is 50 long and carries air of density 1.15 kg/m³. If the flow is 2m³/s. Find the total pressure at the inlet of the duct. Take f = 0.006. Also find air power. [6]
 b) Explain static and velocity pressure in a duct. [4]
 c) Explain types of supply outlets for distribution of air. [6]



