

Total No. of Questions :8]

SEAT No. :

**PE2308**

[Total No. of Pages : 5

[6584]-217

**B.E. (Mechanical Engineering)**

**HEATING VENTILATION AIR-CONDITIONING AND  
REFRIGERATION**

**(2019 Pattern) (Semester-VII) (402041)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**Q1) a)** Discuss any one method of capacity controls of reciprocating compressor. **[6]**

b) Explain with neat sketch of frost control circuit. **[5]**

c) Explain with neat sketch transcritical cycle. **[6]**

OR

**Q2) a)** Explain with neat sketch flooded type evaporator. **[6]**

b) Explain with sketch LP/HP cut-off. **[5]**

c) Explain with sketch simple ejector refrigeration system. **[6]**

**Q3) a)** Explain load calculation factors of air conditioning (four). **[8]**

b) The atmospheric air at 30°C dry bulb temperature and 75% relative humidity enters a cooling coil at the rate of 200 m<sup>3</sup>/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. Determine: **[10]**

- i) The temperature of air leaving the cooling coil
- ii) The capacity of the cooling coil in kW
- iii) The amount of water vapour removed per min, and
- iv) The sensible heat factor for the process

OR

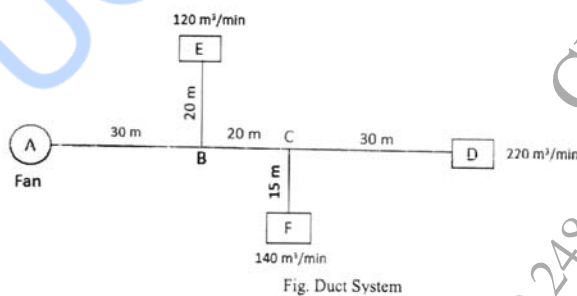
*P.T.O.*

- Q4) a)** Explain Thermal exchange of human body with Environment. [8]
- b)** The room sensible and latent heat loads for an air-conditioned space are 30 kW and 10 kW respectively. The room condition is 25°C dry bulb temperature and 50% relative humidity. The outdoor condition is 35°C dry bulb temperature and 60 % relative humidity. The ventilation requirement is such that on mass flow rate basis 20% of fresh air is introduced and 80% of supply air is recirculated. ADP of the cooling coil is 5°C. Determine: [10]
- RSHF;
  - BPF of cooling coil;
  - supply air flow rate;
  - outside air sensible heat;
  - outside air latent heat;
  - Capacity of cooling coil in TR

- Q5) a)** Explain any four types of air distribution devices. [8]
- b)** A rectangular duct, 0.15 m × 0.12 m is 20m long and carries a standard air at the rate of 0.3m<sup>3</sup>/s having density 1.2 kg/m<sup>3</sup>. Calculate the total pressure required at inlet of the duct in order to maintain the flow and air power required. Take f = 0.005. [10]

OR

- Q6) a)** Explain fan laws and any two types of fans used in air distribution system. [8]
- b)** In the air duct system, as shown figure below, the branch BE is 20 m long and delivers air at 120 m<sup>3</sup>/min. The branch at CF is 15m long and delivers air at 140 m<sup>3</sup>/min. At the end D of the main duct, the air delivered is 220 m<sup>3</sup>/min. Take velocity in main duct AB is 600 m/min. Using a friction chart and equal pressure drop method, determine the diameter and velocity in AB, BC, CD, BE, CF Duct sections. Also calculate maximum pressure drop in the duct system. [10]



- Q7)** a) Explain with neat sketch, air water system. [6]  
b) Write a short note on “Sorbents and Desiccants. [6]  
c) Explain any one circuit of heat pump. [5]

OR

- Q8)** a) Explain with neat sketch variable refrigerant flow system. [6]  
b) Explain liquid spray tower. [6]  
c) Explain thermal storage Air Conditioning systems. [5]

