Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 08

M.Tech. (Mechanical Engineering) (Sem.–3)

DESIGN OF HVAC SYSTEMS

Subject Code : MTME-229

M.Code : 75005

Date of Examination : 24-12-22

Time : 3 Hrs. **Max. Marks : 100**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT question.**
2. **Each question carry TWENTY marks.**

1. a) How can you classify the HVAC systems based on the working fluid used in the thermal distribution system? Explain the salient characteristics and applications of 2 pipe and 4 pipe All Water HVAC system.

   b) What do you understand by Central HVAC system? How does it differ from Individual Room Air Conditioning System or Packaged Air Conditioning Systems?

2. a) What is the function of an air handling unit? Explain the working of an air handling unit giving a neat sketch and explain its components..

   b) What do you understand by refrigeration pipe sizing? How do you calculate the quantity of refrigerant tubing required for an installation?

3. A laboratory having an unusually large latent heat gain is required to be air conditioned. The design conditions and loads are as follows:

   Summer design conditions : 40°C DBT, 27°C WBT

   Inside design conditions : 25°C DBT, 50% RH

   Room sensible heat: 34.9 kW, Room latent heat: 18.6 kW

   The ventilation air requirement is 85 cmm. Assume bypass factor = 0.05.

   Determine : (i) Ventilation load, (ii) Room and effective sensible heat factors, (iii) Apparatus dew point and amount of reheat for economical design, (iv) Supply air quantity, (v) Condition of air entering and leaving coil and supply air temperature, (vi) Grand total heat.

4. a) Briefly describe the components of Air Distribution system giving a neat sketch.

   b) Describe the various types of Supply Air Outlets giving neat sketches and applications. Also explain the considerations for selection and location of outlets.

5. a) A grille has a core area of 0.3 m × 0.5 m. The free flow area is 90 per cent. Discharge coefficient may be taken as 0.8. The recommended value of coefficient K is 5.0. Find core velocit, & cmm of air delivered, so that air velocity is 0.25 m/s for a throw of 15 m.

   b) Discuss the design considerations of restaurant ventilation system design and explain its elements.

6. a) Explain the classification of chiller water circuit arrangements. Briefly describe the water cooled chiller with close circuit cooling tower giving a neat sketch.

   b) Explain the significance of expansion tanks used in HVAC systems. Discuss the expansion tank design guide for Chilled Water systems.

7. a) Explain the Installation, Operating and Maintenance Guidelines for fan coil units.

   b) Briefly discuss the tendering procedure for erection and installation of HVAC systems.

8. a) Classify refrigerants used in HVAC systems. Describe desirable properties of refrigerants.

   b) Explain any one of the following :

      (i) Detailing and Installation of package units.

      (ii) Various types of Pumps used in HVAC systems giving their applications.

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