

Heating Ventilation Air Conditioning (315373)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) Define: i) Dew point temperature ii) Dew point depression.
- b) State Dalton's law of partial pressures as applied to moist air.
- c) Classify the compressors used in refrigeration and air conditioning.
- d) State the necessity of air conditioning (any four).
- e) State any four requirements to be considered during installation of an HVAC system.
- f) State the necessity of cooling load calculation.
- g) Define Air Handling Unit (AHU) and name its main components.

Q.2 Attempt any THREE of the following:**12**

- a) Compare hermetically sealed compressor with open type reciprocating compressor on the basis of: i) Construction ii) Capacity iii) Application iv) Lubrication and maintenance.
- b) Represent the following processes on a psychrometric chart and explain: i) Sensible heating ii) Cooling and dehumidification.
- c) Describe the working of a flooded type evaporator with a neat sketch.
- d) State four desirable properties of insulating material used in air conditioning. Name any four insulating materials.

Q.3 Attempt any THREE of the following:**12**

- a) Explain the concept of heat pump with a neat sketch. Show the cycle on p-h diagram.
- b) Draw the layout of an automobile air conditioning system and state the function of its main components.

- c) Differentiate between central and unitary air conditioning systems (any four points).
- d) Describe how occupant load is calculated in cooling load estimation.

Q.4 Attempt any THREE of the following:

12

- a) Define sensible heat gain and latent heat gain. List the sources of sensible heat gain in a building.
- b) Sketch and explain the extended plenum duct system for air distribution.
- c) Explain the working of an air-cooled condenser with a neat sketch. State its applications.
- d) Describe grilles, registers and diffusers. State any two functions of supply air outlets.
- e) Enlist any four duct materials used in air conditioning. State four desirable properties of duct material.

Q.5 Attempt any TWO of the following:

12

- a) Atmospheric air is at 32 °C DBT and 55 % relative humidity. Using psychrometric relations / chart, find: i) Partial pressure of vapour ii) Dew point temperature iii) Specific humidity iv) Enthalpy v) Wet bulb temperature vi) Specific volume. Take barometric pressure = 101.325 kPa.
- b) Explain with neat sketch the working of thermostatic expansion valve. Write two applications of it.
- c) Illustrate with neat sketch the working of a year-round air conditioning system.

Q.6 Attempt any TWO of the following:

12

- a) Estimate the cooling load of a classroom 10 m × 8 m × 3.5 m for 60 students. Lighting 640 W (fluorescent), one projector 300 W, six ceiling fans of 60 W each. Exposed wall 30 m² (U = 1.8 W/m²K), roof 80 m² (U = 1.2 W/m²K, equivalent $\Delta T = 18$ °C), glass 6 m² (U = 5.8 W/m²K, solar gain 200 W/m²). Outside 40 °C DBT, 40 % RH; inside 25 °C DBT, 50 % RH. Assume suitable data for the rest.
- b) A rectangular duct 0.30 m × 0.20 m is 25 m long and carries standard air at the rate of 0.6 m³/s. Find the total pressure required at the inlet to maintain this flow and the air power. Take $f = 0.005$. Also find the equivalent circular diameter for equal friction.
- c) Enlist different types of fans used in air conditioning systems. Explain centrifugal fan with a neat sketch.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in