

Heating Ventilation Air Conditioning (315373)

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

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) Relative humidity ii) Specific humidity.
- b) Represent the cooling with dehumidification process on a psychrometric chart.
- c) State any four functions of an expansion device.
- d) Define: i) Ventilation ii) Infiltration.
- e) List any four sources of latent heat gain in a building.
- f) Define: i) One tonne of refrigeration ii) Coefficient of performance (COP).
- g) State any four advantages of split air conditioner over window air conditioner.

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

- a) State the advantages and disadvantages of open type reciprocating compressor over hermetically sealed compressor.
- b) Represent the following processes on a psychrometric chart and explain: i) Sensible heating ii) Heating with humidification.
- c) Describe the flooded type evaporator with a neat sketch. State its applications.
- d) Explain the working of an automatic expansion valve with a neat sketch.

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

- a) List any four insulating materials used in air conditioning and state four desirable properties of insulating material.
- b) Explain the construction and working of a split air conditioner with a neat sketch.
- c) Compare central air conditioning system with unitary air conditioning system (any four points).
- d) Explain how occupant load and lighting load are calculated in cooling load estimation.

Q.4 Attempt any THREE of the following:**12**

- a) Explain the working of a water cooled shell and tube condenser with a neat sketch.
- b) Explain radial and perimeter loop duct systems with neat sketches.
- c) Explain the use of dampers and filters in air distribution systems.
- d) Draw the layout of a car air conditioning system and state the function of each component.
- e) Explain natural and mechanical ventilation with sketches.

Q.5 Attempt any TWO of the following:**12**

- a) 30 m³/min of outdoor air at 35 °C DBT and 50 % RH is mixed adiabatically with 70 m³/min of re-circulated air at 25 °C DBT and 50 % RH. Find the dry bulb temperature, specific humidity, enthalpy and relative humidity of the mixture. Show the process on a psychrometric chart.
- b) Explain with a neat sketch the thermostatic expansion valve. State its two applications.
- c) Explain the year-round air conditioning system with a schematic diagram. State its applications.

Q.6 Attempt any TWO of the following:**12**

- a) Describe various sources of heat gain considered in cooling load calculation. Estimate the cooling load of a seminar hall 15 m × 10 m × 4 m with 100 persons, lighting 1.2 kW (fluorescent), audio-visual equipment 1 kW. Roof 150 m² (U = 1.1 W/m²K, equivalent ΔT 20 °C), exposed walls 60 m² (U = 1.8 W/m²K), glass 10 m² (U = 5.8 W/m²K, solar gain 150 W/m²). Outside 40 °C DBT, 35 % RH; inside 25 °C DBT, 50 % RH.
- b) Air flows at 1.2 m³/s through a rectangular duct of 0.5 m × 0.3 m and 30 m length. Taking $f = 0.005$ and fan efficiency 65 %, find: i) pressure loss due to friction ii) total pressure at inlet iii) air power and fan power iv) equivalent diameter of circular duct for equal friction and equal velocity.
- c) Explain with a neat sketch summer air conditioning system for hot and dry outdoor conditions.

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