

Heating Ventilation Air Conditioning (315373)

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

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) Wet bulb depression ii) Degree of saturation.
- b) Explain the concept of Sensible Heat Factor (SHF).
- c) State any four advantages of hermetically sealed compressor.
- d) State two advantages and two limitations of capillary tube used as an expansion device.
- e) Explain the concept of basement ventilation.
- f) Classify air ducts on the basis of i) function (supply) ii) velocity / pressure iii) cross-section.
- g) List any four factors affecting human comfort.

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

- a) Represent the following psychrometric processes on a psychrometric chart and explain: i) Heating and humidification ii) Cooling and dehumidification.
- b) Explain with a neat sketch the construction and working of a thermostatic expansion valve.
- c) What is the purpose of insulation in air conditioning? State the desirable properties of an insulating material.
- d) Draw a neat sketch of a window air conditioner and explain its working.

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

- a) Explain the working of a centrifugal compressor with a neat sketch.
- b) Explain with a neat sketch the summer air conditioning system for hot and humid outdoor conditions.
- c) Differentiate between central air conditioning and unitary air conditioning system on the basis of capacity, cost, space requirement and control.

- d) Explain in detail any four losses in ducts.

Q.4 Attempt any THREE of the following:

12

- a) Differentiate between flooded and dry expansion evaporators. Draw a neat sketch of a flooded evaporator.
- b) Explain how the heat gain from occupants is calculated. Give typical values of sensible and latent heat for different activities.
- c) Explain the concept of Variable Air Volume (VAV) system. How does it work?
- d) List the various supply air outlets used in air distribution. Explain the ceiling diffuser with a sketch.
- e) Explain the automobile air conditioning system with a neat sketch.

Q.5 Attempt any TWO of the following:

12

- a) Air at 35 °C DBT and 40 % RH is cooled and dehumidified to 22 °C DBT and 16 °C WBT. Plot the process on a psychrometric chart and find: i) Specific humidity at initial condition ii) Dew point temperature at final condition iii) Change in enthalpy iv) Moisture removed per kg of dry air.
- b) Explain with a neat sketch the year-round air conditioning system with its controls.
- c) Explain the construction and working of a scroll compressor with a neat sketch.

Q.6 Attempt any TWO of the following:

12

- a) Estimate the cooling load for a computer laboratory 9 m × 7 m × 3.2 m of your institute having 30 computers (150 W each), 32 students and 1 faculty, lighting 480 W (fluorescent). Exposed wall 25 m² (U = 1.9 W/m²K), glass 5 m² (U = 5.8 W/m²K, solar gain 180 W/m²). Outside 38 °C DBT, 45 % RH; inside 24 °C DBT, 50 % RH. Assume suitable data.
- b) Suggest a suitable duct system for an L-shaped building. Explain it with a neat sketch.
- c) A 1.5 TR split air conditioner works on a simple saturated vapour compression cycle using R-134a with evaporator at 5 °C and condenser at 45 °C. The enthalpies are: at compressor inlet 401.5 kJ/kg, at compressor outlet 426.4 kJ/kg and at condenser outlet 263.9 kJ/kg. Find: i) Refrigerating effect ii) COP iii) Mass flow rate of refrigerant iv) Compressor power. Show the cycle on p–h and T–s diagrams.

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