

Electric Vehicle Technology (315335)

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) State the main goal of the EV30@30 campaign.
- b) Enlist any four types of motors used in electric vehicles.
- c) State the meaning of 'deep cycle' of a battery.
- d) State the typical range of battery pack capacity for: i) Electric car ii) Electric bus
- e) State any two objectives of the Maharashtra Electric Vehicle Policy, 2021.
- f) State the meaning of V2X in EV charging.
- g) State any two precautions to be followed while charging an EV.

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

- a) Discuss the advantages and disadvantages of electric vehicles over IC engine vehicles.
- b) Draw the block diagram of a battery electric vehicle (BEV) architecture and name its main components.
- c) Draw and explain a neat labelled block diagram for torque control of a BLDC motor.
- d) Differentiate between AC charging and DC fast charging of EVs. (Any four points)

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

- a) Explain the operating principle of a Synchronous Reluctance Motor (SynRM) with a neat diagram.
- b) Give the classification of batteries used in electric vehicles.
- c) Describe the function of a bidirectional DC-DC converter in an EV with a neat diagram.

- d) Describe the basic demand incentives and scrappage incentives for EVs under the Maharashtra EV Policy, 2021.

Q.4 Attempt any THREE of the following:

12

- a) Draw and explain the parallel hybrid electric vehicle configuration.
- b) Compare a fuel cell and a battery on the following points: i) Energy source ii) Cost iii) Weight iv) Efficiency
- c) An electric car should run 150 km on one charge with an average consumption of 140 Wh/km. The system voltage is 350 V and the overall efficiency is 90 %. Calculate the battery capacity in kWh and Ah. If 3.7 V, 35 Ah Li-ion cells are used, find the number of cells in series and in parallel.
- d) Explain the concept of battery swapping. State its advantages and limitations.
- e) State the physical location of the motor and battery in a two-wheeler and a four-wheeler electric vehicle.

Q.5 Attempt any TWO of the following:

12

- a) Explain the construction and working of a Permanent Magnet Synchronous Motor (PMSM). State its advantages, limitations and applications in EVs.
- b) State the need of a Battery Management System. Draw its block diagram and explain the functions of BMS.
- c) An electric bus has a 300 kWh battery. Starting with a full battery, it runs 180 km in a day with an average consumption of 1.1 kWh/km. Calculate: i) the SOC at the end of the day ii) the time required to charge it back to 100 % SOC with a 60 kW DC charger (efficiency 95 %) iii) the time with a 120 kW DC charger (same efficiency).

Q.6 Attempt any TWO of the following:

12

- a) Compare induction motor and BLDC motor used in EVs on the basis of: power-to-weight ratio, torque-speed characteristics, cost of controller, cost of motor, efficiency and maintenance.
- b) Draw the block diagram of power electronic converters used in a typical EV. Explain the functions of DC-DC converter, DC-AC converter, AC-DC converter and filters.
- c) i) Explain the mechanical and electrical connections of motors in EVs. ii) State any four selection criteria of EV motors.

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