

Electric Vehicle Technology (315335)

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) Enlist the types of electric vehicles based on the energy source used.
- b) What is the EV30@30 campaign? State its target.
- c) Define: i) Ampere-hour (Ah) capacity ii) Energy stored in a battery
- d) State the need of a Battery Management System in an EV.
- e) State the meaning of DC fast charging.
- f) State the physical location of the motor in a four-wheeler EV with one example.
- g) Define the term 'E-Mobility Strategy'.

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

- a) Compare a battery electric vehicle (BEV) and a hybrid electric vehicle (HEV) on the following points: i) Driving component ii) Energy source used iii) Models available in market iv) Problems
- b) Draw and explain the series-parallel (power split) hybrid electric vehicle configuration.
- c) An e-rickshaw needs a range of 100 km per charge with an energy consumption of 70 Wh/km. The system voltage is 48 V and only 80 % depth of discharge is allowed. Find the battery capacity in kWh and Ah. If 3.2 V, 50 Ah LiFePO₄ cells are used, find the number of cells in series and parallel.
- d) State the steps taken by the Government of India for faster adoption of electric vehicles.

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

- a) Explain the construction and working of an axial flux ironless permanent magnet motor. State any two advantages and two limitations.
- b) Define the following battery parameters: i) Self-discharge rate ii) Battery geometry iii) Battery temperature, heating and cooling needs iv) Number of

deep cycles

- c) Describe the V2H / V2B (Vehicle-to-Home / Vehicle-to-Building) system of charging with a neat diagram.
- d) Describe how the Maharashtra EV Policy, 2021 aims to reduce air pollution in urban areas. State the road tax provision for EVs in Maharashtra.

Q.4 Attempt any THREE of the following:

12

- a) Explain the working principle of a fuel cell with a neat diagram. State any two differences between a fuel cell and a battery.
- b) Explain regenerative braking in an electric vehicle with a neat diagram.
- c) State the salient features of an induction motor used as an EV drive.
- d) A 30 kWh EV battery is to be charged from 15 % SOC to 80 % SOC. Calculate the charging time using: i) a 3.3 kW home AC charger with 88 % efficiency ii) a 25 kW DC charger with 92 % efficiency.
- e) Draw a labelled block diagram of a battery electric vehicle showing its main components. State the function of the vehicle control unit (VCU).

Q.5 Attempt any TWO of the following:

12

- a) Explain the construction and working of a BLDC motor with a neat diagram. Draw the block diagram for its torque control.
- b) Draw the block diagram of BMS and explain its functions. Explain battery condition monitoring and the '3R' (Reduce, Reuse, Recycle) process for batteries.
- c) Explain the selection, sizing and components of a public EV charging station. Draw its single line diagram.

Q.6 Attempt any TWO of the following:

12

- a) Compare BLDC motor, PMSM, induction motor and switched reluctance motor used in EVs on the basis of: i) Power-to-weight ratio ii) Torque-speed characteristics iii) Cost of controller iv) Cost of motor
- b) Explain the charging modes of EVs defined in IEC 61851-1 with neat diagrams. State the connectors used for AC and DC charging.
- c) Explain the construction and working of a lead-acid battery with a neat diagram. Compare lead-acid and Li-ion batteries. (Any four points)

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