Electric Vehicle Technology (315335)

MSBTE Diploma · K-Scheme · Electrical Engineering (EE / EK / EP), Semester 5 · Important Questions

How this list was made: Based on MSBTE papers **W-2025 and S-2026** available on msbte.ac.in (these are the only two K-scheme papers of this course so far; the W-2025 paper is a scanned copy and was read from its page images). Every question of both papers was grouped by topic. With only two papers, **High** simply means **asked in both papers**, **Medium** = asked in one paper, **Low** = in the K-scheme syllabus but not asked yet. Two papers are a small sample, so treat this as practice guidance only — not a prediction of the exam.

Unit-wise marks (MSBTE specification table): Unit I – 10, Unit II – 20, Unit III – 16, Unit IV – 16, Unit V – 8 (total 70).

Most repeated topics

#	Topic	Unit	Times asked
1	Types of electric vehicles (BEV, HEV, PHEV, FCEV)	1	3 (S-26, W-25)
2	Mechanical and electrical connections of motor; physical location of motor/battery	2	3 (S-26, W-25)
3	Battery parameters – energy density, specific energy, self-discharge, geometry, temperature, deep cycle	3	3 (S-26, W-25)
4	Battery Management System – need, block diagram, functions	3	3 (S-26, W-25)
5	AC vs DC charging / Level-1, Level-2, Level-3 (DC fast) charging	4	3 (S-26, W-25)
6	Maharashtra EV Policy 2021 – incentives (charging infrastructure, scrappage, road tax / toll)	5	3 (S-26, W-25)
7	EV vs IC engine vehicle – comparison / advantages and disadvantages	1	2 (S-26, W-25)
8	Block diagram of EV subsystems / EV architecture	1	2 (S-26, W-25)
9	BLDC motor – principle, features, torque control block diagram	2	2 (S-26, W-25)
10	Classification of EV drives / motors used in EV	2	2 (S-26, W-25)

Unit I – Basics of Electric Vehicles (10 M)

Question / topic	Marks	Asked in	Probability
Types of electric vehicles (BEV, HEV, PHEV, FCEV) • List the types of electric vehicles. *(W-25 Q.1a)* • Enlist the types of Electric Vehicle. *(S-26 Q.1a)* • Enlist the different types of electric vehicles. *(S-26 Q.1f)*	2 M	S-26, W-25	**High**
EV vs IC engine vehicle – comparison / advantages and disadvantages • Discuss the advantages and disadvantages of EVs over IC engine vehicles. *(W-25 Q.2a)* • Compare EV and IC engine vehicle: power source, maintenance, capital cost, running cost. *(S-26 Q.2c)*	4 M	S-26, W-25	**High**

Block diagram of EV subsystems / EV architecture • Draw and explain the block diagram of electric vehicle subsystems. *(W-25 Q.2b)* • Draw block diagram of EV architecture showing name of main components. *(S-26 Q.4d)*	4 M	S-26, W-25	**High**
BEV vs HEV comparison (driving component, energy source, models, problems) • Compare battery EV and hybrid EV on given points. *(S-26 Q.4e)*	4 M	S-26	**Medium**
History and evolution of EVs • Describe the history and evolution of electric vehicles. *(W-25 Q.4a)*	4 M	W-25	**Medium**
Series, parallel and series-parallel HEV architectures; PHEV and FCEV configuration In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit II – Electric Vehicle Drives (20 M)

Question / topic	Marks	Asked in	Probability
Mechanical and electrical connections of motor; physical location of motor/battery • i) Mechanical and electrical connections of motors ii) physical location of motor with examples. *(W-25 Q.6a)* • Explain the electrical and mechanical connections in an EV. *(S-26 Q.3a)* • Physical location of motor and battery in a four-wheeler EV. *(S-26 Q.1g)*	2 M, 4 M, 6 M	S-26, W-25	**High**
BLDC motor – principle, features, torque control block diagram • Draw and explain a neat labelled block diagram of BLDC motor for torque control. *(W-25 Q.2c)* • Principle and working of BLDC motor; block diagram of torque control. *(S-26 Q.5a)*	4 M, 6 M	S-26, W-25	**High**
Classification of EV drives / motors used in EV • Classify electric drives for electric vehicle based on type of motor. *(W-25 Q.1b(1))* • Enlist the motors used in EV; salient features of BLDC motor. *(S-26 Q.2d)*	2 M, 4 M	S-26, W-25	**High**
Comparison of EV motors (power-to-weight, torque-speed, controller cost, motor cost) • Compare EV motors on power-to-weight ratio, torque-speed, cost of controller, cost of motor. *(W-25 Q.5a)* • Compare IM and BLDC EV motors on the same four points. *(S-26 Q.6c)*	6 M	S-26, W-25	**High**

PMSM – working principle, advantages, features • Working principle of PMSM; two advantages and features. *(S-26 Q.4c)*	4 M	S-26	**Medium**
Selection criteria of EV motors • State selection criteria of EV motors. *(S-26 Q.6b)*	6 M	S-26	**Medium**
Axial flux ironless permanent magnet motor • Construction and working; two advantages and limitations. *(W-25 Q.3a)*	4 M	W-25	**Medium**
Synchronous reluctance motor (SynRM) • Operating principle of SynRM with diagram. *(W-25 Q.3b)*	4 M	W-25	**Medium**
Brushed DC motor and induction motor as EV drives; PM-assisted SynRM; rating of motors In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit III – Batteries and Energy Storage Systems (16 M)

Question / topic	Marks	Asked in	Probability
Battery parameters – energy density, specific energy, self-discharge, geometry, temperature, deep cycle • Define energy density and specific energy (printed twice in the paper). *(W-25 Q.1c/1d)* • State the meaning of deep cycle of a battery. *(W-25 Q.1e)* • Define self discharge rate, battery geometry, battery temperature and deep cycle. *(S-26 Q.3b)*	2 M, 4 M	S-26, W-25	**High**
Battery Management System – need, block diagram, functions • Draw a neat labelled block diagram of BMS and explain the architecture. *(W-25 Q.5b)* • Draw block diagram of BMS and explain function of each block. *(S-26 Q.5b)* • State need of BMS. *(S-26 Q.1b)*	2 M, 6 M	S-26, W-25	**High**
Fuel cell vs battery • Differentiate between fuel cell and battery (any four points). *(W-25 Q.4b)* • Compare fuel cell and battery: energy source, cost, weight, efficiency. *(S-26 Q.4b)*	4 M	S-26, W-25	**High**
Battery capacity calculation from range and consumption (numerical) • 120 km, 160 Wh/km, 80 % efficiency, 100 V – battery capacity in kWh and Ah. *(S-26 Q.2b)*	4 M	S-26	**Medium**
Battery pack capacity ranges for vehicle segments • Ranges of battery pack capacity for buses and trucks. *(W-25 Q.1b)*	2 M	W-25	**Medium**

Classification of EV batteries • Give the classification of batteries used in electric vehicles. *(W-25 Q.3c)*	4 M	W-25	**Medium**
Li-ion battery – construction, working, advantages, disadvantages • Construction and working of Li-ion battery; advantages and disadvantages. *(W-25 Q.6b)*	6 M	W-25	**Medium**
Supercapacitor and flywheel energy storage In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Lead-acid, NiMH, Ni-Cd, Ni-Zn, Al-ion, Al-air batteries – comparison, selection factors In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Series / parallel connection of cells – battery pack design In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Fuel cell working principle, terminology and types (AFC, PEMFC, PAFC, MCFC, SOFC) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
BMS – battery condition monitoring and 3R (reduce, reuse, recycle) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit IV – Converters and EV Chargers (16 M)

Question / topic	Marks	Asked in	Probability
AC vs DC charging / Level-1, Level-2, Level-3 (DC fast) charging • Meaning of DC fast charging; difference from AC charging (with precautions, part ii). *(W-25 Q.6c(i))* • Compare AC and DC charging methods (any four points). *(S-26 Q.2a)* • Difference between Level-1, Level-2 and Level-3 (DC fast) charging. *(S-26 Q.5c)*	3 M, 4 M, 6 M	S-26, W-25	**High**
Charging time numerical • E-bus, 240 kWh battery at 30% SOC, 24 kW DC charger – charging time. *(W-25 Q.4c)* • 50 kWh battery, 20% to 80% SOC, 7.4 kW Level-2 charger – charging time. *(S-26 Q.6a)*	4 M, 6 M	S-26, W-25	**High**
Smart charging – V2B/V2H, V2X, V2G • Describe V2B/V2H system of charging. *(W-25 Q.3d)* • Meaning of V2X; its significance in the smart grid ecosystem. *(W-25 Q.4d)*	4 M	W-25	**Medium**
Charging modes as per IEC 61851 (Mode 1–4) • State and explain the charging modes of EVs defined in IEC	6 M	W-25	**Medium**

standard. *(W-25 Q.5c)*			
Precautions while charging EV • State the precautions to be followed while charging EV (part ii). *(W-25 Q.6c(ii))*	3 M	W-25	**Medium**
Battery swapping • Define battery swapping. *(S-26 Q.1d)*	2 M	S-26	**Medium**
Bidirectional DC-DC converter in EV • Describe the function of bidirectional DC-DC converter in EVs. *(S-26 Q.3c)*	4 M	S-26	**Medium**
Power electronics in EV – DC-DC, DC-AC, AC-DC converters and filters (block diagram) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Charging methods (home, trickle) and on-board / off-board / wireless charging In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Public charging station – selection, sizing, components, single line diagram In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit V – Electric Vehicle (EV) Policies (8 M)

Question / topic	Marks	Asked in	Probability
Maharashtra EV Policy 2021 – incentives (charging infrastructure, scrappage, road tax / toll) • Incentives for installation of EV charging infrastructure in Maharashtra. *(W-25 Q.2d)* • Policy for road tax and toll in Maharashtra for EVs. *(W-25 Q.4e)* • Role of scrappage incentives in promoting EV adoption. *(S-26 Q.4a)*	4 M	S-26, W-25	**High**
EV30@30 campaign – goal • State the main goal of the EV30@30 campaign. *(W-25 Q.1f)* • State the goal of EV30@30 campaign. *(S-26 Q.1c)*	2 M	S-26, W-25	**High**
Maharashtra EV Policy 2021 – objectives / reducing urban air pollution • Any two objectives of Maharashtra EV Policy, 2021. *(S-26 Q.1e)* • How the Maharashtra EV policy aims to reduce air pollution in urban areas. *(S-26 Q.3d)*	2 M, 4 M	S-26	**Medium**
E-mobility strategy • Define the term 'E-Mobility Strategy'. *(W-25 Q.1g)*	2 M	W-25	**Medium**
NEMMP 2020 – objectives, implementation structure; barriers to e-mobility; Government steps In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Exam tips from the two papers

- Both papers had a **charging-time numerical** (W-25: e-bus, S-26: 50 kWh car with 7.4 kW charger) and S-26 also had a **battery capacity (kWh and Ah) numerical**. Learn: E = capacity × ΔSOC, t = E / (P × η), Ah = Wh / V.
- **BMS block diagram** (6 M) and **BLDC torque-control block diagram** came in both papers — practise drawing them neatly.
- **Comparison of EV motors** on power-to-weight ratio, torque-speed, controller cost and motor cost was asked as 6 M in both papers.
- Unit V (policies) is short but regular: EV30@30 goal, Maharashtra EV Policy 2021 objectives and incentives (charging, scrappage, road tax). Policy figures change — read the latest GR.
- Some questions were printed twice in the same paper (W-25 Q1 c/d, S-26 Q1 a/f), so Q.1 is easy scoring if you know the definitions.

Note: This is an **important-question list 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