



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class: TY	Program: B.Tech
Branch Code: ELE	Pattern:2023
Name of Course: Electrical Mobility	Course Code:2306306B
Max. Marks:60	Duration:2.30 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required but justify it.
4. Draw the neat, labelled diagrams, wherever necessary.
5. The last columns indicate the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Marks CO**

**Question No. 1**

- 1a) Describe series and parallel hybrid architectures with suitable diagrams (6) CO1

**Question No. 2**

- 2a) Compare PMSM and Induction Motor with respect to efficiency, torque characteristics, and suitability for EVs (6) CO2

**Question No. 3**

- 3a) What is battery pack sizing? Explain the factors affecting battery capacity selection for an EV drive cycle. (8) CO2

**OR**

- 3b) What is cell balancing? Explain passive and active balancing with neat diagrams (8) CO1
- 3c) A small electric vehicle is powered by a 2500 W, 72 V BLDC motor and requires an operating time of 3 hours. The nominal cell voltage is 3.65 V, and the nominal cell capacity is 3.2 Ah. Find the motor current requirement, the battery capacity needed for the given duration, and the series-parallel cell configuration necessary to design a 72 V, 200 Ah battery pack. (8) CO4

**OR**

- 3d) Explain the significance of C-rate and depth of discharge (DoD) in EV battery performance and lifespan (8) CO2

**Question No. 4**

- 4a) Explain the structure and operation of DC fast-charging systems used in EVs (8) CO3

**OR**

- 4b) Describe CHAdeMO and CCS fast-charging standards. Compare their connector types, power ratings, and communication protocols. (8) CO3
- 4c) Describe the differences between Level 1 and Level 2 charging infrastructure for electric vehicles. Compare their charging speeds, power requirements, installation costs, and typical applications (8) CO3

**OR**

- 4d) Explain Smart Grid integration and Demand Response. How do they contribute to efficient energy management? (8) CO2, CO3

**Question No. 5**

- 5a) Explain the socio-economic impact of EV adoption in India. Discuss job creation, skill requirements, and rural vs. urban mobility transformation. (8) CO3

**OR**

- 5b) Explain Maharashtra and any other state EV policies. Compare their adoption targets, incentives, and infrastructure plans (8) CO3
- 5c) What is global EV standardization? Explain with example how entrepreneurial initiatives foster innovation in clean energy and electric vehicles. (8) CO3

**OR**

- 5d) Describe the role of IoT in smart EVs. Explain predictive maintenance, V2G communication, and telematics (8) CO2

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