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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## May / June 2025 Semester End Main Examinations

**Programme: B.E.** **Semester: VIII**

**Branch: Institutional Elective** **Duration: 3 hrs.**

**Course Code: 22EE8OE3EV** **Max Marks: 100**

**Course: Electric and Hybrid Vehicles**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | UNIT - I | CO | PO | Marks |
|---|---|---|---|---|---|
| 1 | a) | Discuss the need for electrifying the transportation sector. Outline the historical evolution of electric and hybrid electric vehicles. What were the reasons behind the decline of electric vehicles post World War I? | CO1 | PO1 | **08** |
| | b) | Write a short note on Air pollution. | CO2 | PO1 | **05** |
| | c) | Elaborate on the importance of different transportation. | CO1 | PO2 | **07** |
| | | **OR** | | | |
| 2 | a) | What are the different types of pollution caused by IC engine vehicles? Describe each of them in detail. | CO2 | PO1 | **10** |
| | b) | Describe the development and milestones in the history of electric and hybrid electric vehicles. | CO1 | PO2 | **10** |
| | | **UNIT - II** | | | |
| 3 | a) | With a neat sketch and explain the general EV configuration. | CO1 | PO2 | **10** |
| | b) | Explain with diagram of concept of hybrid electric drive train. | CO4 | PO2 | **10** |
| | | **OR** | | | |
| 4 | a) | With graph explain about the tractive effort and transmission requirement. | CO2 | PO2 | **10** |
| | b) | With a diagram, describe the configuration of a parallel hybrid electric drive train. | CO4 | PO2 | **10** |
| | | **UNIT - III** | | | |
| 5 | a) | Illustrate and explain the functional block diagram of a typical electric propulsion system. | CO4 | PO2 | **10** |

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|---|---|---|---|---|---|---|
| | | b) | Describe the operation of a two-quadrant chopper DC motor drive for electric vehicles with relevant waveforms. | *CO4* | *PO2* | **10** |
| | | | **OR** | | | |
| | 6 | a) | With neat diagram and explain switched reluctance motor drive | *CO4* | *PO2* | **10** |
| | | b) | With a neat diagram and explain permanent magnetic BLDC motor drive. | *CO4* | *PO2* | **10** |
| | | | **UNIT - IV** | | | |
| | 7 | a) | What are the battery parameters? Explain each briefly. | *CO3* | *PO2* | **10** |
| | | b) | List the different types of fuel cells and explain any two in detail. | *CO3* | *PO2* | **10** |
| | | | **OR** | | | |
| | 8 | a) | Explain the operational principle of Proton Exchange Membrane Fuel Cells (PEMFC). How do they function, and why are they considered suitable for use in electric vehicles? | *CO3* | *PO2* | **10** |
| | | b) | Discuss the basic principle, features and performance of ultra-capacitors as a storage device. | *CO3* | *PO2* | **10** |
| | | | **UNIT - V** | | | |
| | 9 | a) | Describe the major components of an electric vehicle charging station. | *CO5* | *PO2* | **10** |
| | | b) | Explain with block diagram of solar powered electric charging station. | *CO5* | *PO2* | **10** |
| | | | **OR** | | | |
| | 10 | a) | Discuss the fire prevention requirements in EV charging stations and the safety measures needed. | *CO5* | *PO2* | **10** |
| | | b) | Compare slow and fast EV chargers by explaining their differences, advantages, and suitable applications. | *CO5* | *PO2* | **10** |

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