*Basavarajeswari Group of Institutions*
# BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT
(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

| USN | | | | | | | | | | | Course Code | 2 | 1 | E | E | 6 | 4 | 3 |
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Sixth Semester B.E. Degree Examinations, September/October 2024
# ELECTRIC VEHICLE TECHNOLOGY

**Duration: 3 hrs**  **Max. Marks: 100**

*Note:   1. Answer any **FIVE** full questions choosing ONE full Question from each Module.*
*         2. Missing data, if any, may be suitably assumed*

| *Q. No* | | *Question* | *Marks* | *(RBTL:CO:PI )* |
|---|---|---|---|---|
| | | **Module-1** | | |
| **1.** | **a.** | With neat sketch, compare the differences between the electrical and conventional internal combustion engine vehicles. | **10** | **(2 :1 : 2.6.2)** |
| | **b.** | With a neat block diagram, explain about the series-parallel hybrid electrical vehicle (EV) and discuss about the modes of operation. | **10** | **(2 :1 : 2.6.2)** |
| | | **(OR)** | | |
| **2.** | **a.** | Define and explain the tractive effort on an electric vehicle and obtain the relation between speed, power and energy. | **10** | **(2 :1 : 2.6.2)** |
| | **b.** | Explain the effects of aerodynamic drag and rolling resistance on the moving vehicle. | **10** | **(2 :1 : 2.6.2)** |
| | | **Module-2** | | |
| **3.** | **a.** | With neat sketch, explain the principle and operation of DC motor drive and obtain the relation between the torque, speed, input voltage and back EMF. | **10** | **(2 :2 : 2.6.2)** |
| | **b.** | With a neat block diagram, explain the torque control of BLDC motor drives and discuss the factors to be considered for selection and sizing of electric motors for EV application. | **10** | **(2 :2 : 2.6.2)** |
| | | **(OR)** | | |
| **4.** | **a.** | With a neat block diagram, explain the constant volt/Hertz control method of Induction motor. | **10** | **(2 :2 : 2.6.2)** |
| | **b.** | Discuss the factors to be considered for selection and sizing of electric motors for EV application. | **10** | **(2 :2 : 2.6.2)** |
| | | **Module-3** | | |
| **5.** | **a.** | With a neat circuit diagram, explain the operation of three phase rectifier for the Hybrid Electrical Vehicle (HEV) applications. | **10** | **(2 :3 : 2.6.2)** |
| | **b.** | With a neat circuit diagram explain the operation of Forward converter for HEV applications. | **10** | **(2 :3 : 2.6.2)** |

**Note: (RBTL - Revised Bloom's Taxonomy Level:  CO - Course Outcome: PI– Performance Indicator)**

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|---|---|---|---|---|
| **6.** | **a.** | With a neat circuit diagram, explain the operation of non-isolated bidirectional DC-DC converter for the HEV applications. | **10** | **(2 :3 : 2.6.2)** |
| | **b.** | With a neat circuit diagram, explain the operation of full bridge DC-DC converter for the HEV applications. | **10** | **(2 :3 : 2.6.2)** |

## Module-4

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|---|---|---|---|---|
| **7.** | **a.** | List and compare the characteristics of different types of battery selection for EV application and explain in detail. | **10** | **(2 :4 : 2.6.2)** |
| | **b.** | With a neat sketch, explain the EV's Battery Management System (BMS) architecture. | **10** | **(2 :4 : 2.6.2)** |

**(OR)**

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|---|---|---|---|---|
| **8.** | **a.** | In detail explain the following terminologies related the battery : <br><br>(i) Depth of Discharge (DoD) (ii) Specific power and specific density <br>(iii) Ampere hour (iv) number of deep cycles and battery life. | **10** | **(2 :4 : 2.6.2)** |
| | **b.** | With a relevant equivalent circuit approach, explain the modelling of Lithium-ion battery. | **10** | **(2 :4 : 2.6.2)** |

## Module-5

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|---|---|---|---|---|
| **9.** | **a.** | Compare the need of DC and AC supply charging methods of electric vehicles and mention their advantages. | **10** | **(2 :5 : 2.6.2)** |
| | **b.** | Explain about the Bharat AC-001 and DC-001 charging protocol of electric vehicles. | **10** | **(2 :5 : 2.6.2)** |

**(OR)**

| | | | | |
|---|---|---|---|---|
| **10** | **a.** | With a neat block diagram, explain the technology for Vehicle to Grid (V2G) operations and mention their advantages and disadvantages. | **10** | **(2 :5 : 2.6.2)** |
| | **b.** | For our country Bharath, mention the suggestive plan that helps out the existing companies to improve their charging infrastructure for the future EV mobility system. | **10** | **(2 :5 : 2.6.2)** |

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