

Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

2022 SCHEME

USN

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Course Code

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Sixth Semester B.E. Degree Examinations, May/June 2026

FUNDAMENTALS OF 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

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<u>Module-1</u>			
1.	a. Describe the main components of an electric vehicle and explain their functions.	10	(2:1:1.4.1)
	b. Discuss the advantages and disadvantages of electric vehicles compared to Internal combustion engine vehicles.	10	(2:1:1.4.1)
(OR)			
2.	a. List out the classification of electric vehicles with a neat diagram. Define Battery Operated Electric Vehicle (BEV) and Hybrid Electric Vehicle (HEV).	10	(2:1:1.4.1)
	b. Compare Internal combustion engine vehicles with electric vehicles in context with technology used.	10	(2:1:1.4.1)
<u>Module-2</u>			
3.	a. With a neat diagram, explain the three subsystems of architecture of electric vehicle.	10	(2:2:1.4.1)
	b. A vehicle of mass 1800 kg climbs a hill with a gradient of 6 % at a constant speed of 18 m/s. The coefficient of rolling resistance is 0.02. The drag coefficient is 0.35, frontal area is 2.5 m ² , and air density is 1.2 kg/m ³ . Determine the total resisting force or tractive force acting on the vehicle and the motor power required.	10	(2:2:1.4.1)
(OR)			
4.	a. Define battery modelling and explain the different types of battery models.	10	(2:2:1.4.1)
	b. A passenger car of mass 1600 kg is moving at a speed of 20 m/s up a road having a gradient of 5% , while accelerating at 1.2 m/s² . The coefficient of rolling resistance for the car is 0.025 . The aerodynamic drag acting on the car is characterized by a drag coefficient of 0.32 , a frontal area of 2.4 m² , and the air density is 1.25 kg/m³ . Determine the total tractive effort required to propel the car and the corresponding power developed by the engine under these conditions.	10	(2:2:1.4.1)
<u>Module-3</u>			
5.	a. With a neat diagram explain the configuration of Induction motor drive in application to electric vehicle.	10	(2:3:1.4.1)

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

- b. With a neat diagram, explain the architecture of electric propulsion system. **10** **(2:3:1.4.1)**

(OR)

6. a. Explain the various control methods used in Switched Reluctance Motor (SRM) drives such as current control, voltage control, angle control, torque control and speed control. **10** **(2:3:1.4.1)**
- b. Compare DC motor, induction motor, and permanent magnet motor drives and switched reluctance motor drive in application to electric vehicle. **10** **(2:3:1.4.1)**

Module-4

7. a. Explain the design considerations involved in battery systems with respect to cell-to-module, cell-to-pack, and cell-to-chassis configurations. **10** **(2:4:1.4.1)**
- b. List the characteristics of charging and discharging used in electric vehicle. **10** **(2:4:1.4.1)**

(OR)

8. a. Describe the working principle and cell reaction of nickel metal hydride batteries. **10** **(2:4:1.4.1)**
- b. Explain with a neat diagram on the interface between battery and motive power sources in EVs. **10** **(2:4:1.4.1)**

Module-5

9. a. With a neat diagram explain about energy management strategies used in hybrid electric vehicle. **10** **(2:5:1.4.1)**
- b. Discuss and compare rule-based and optimization-based energy management strategies used in electric vehicles. **10** **(2:5:1.4.1)**

(OR)

10. a. Classify the different energy management strategies with suitable examples. **10** **(2:5:1.4.1)**
- b. Define and explain any four common techniques used in optimization-based energy management strategy. **10** **(2:5:1.4.1)**

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