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Course Code 

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Sixth Semester B.E. Degree Examinations, June/July 2025

## 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>
<b><u>Module-1</u></b>			
1.	a. Interpret a block diagram of a BEV and provide an explanation of its major electric drivetrain subsystems.	10	(2 :1: 1.3.1)
	b. Describe the different categories of electric vehicles according to their level of electrification and parameters such as voltage, current, speed, and charging duration.	10	(2 :1: 1.3.1)
(OR)			
2.	a. Identify the performance advantages and disadvantages of ICE vehicles versus electric hybrid vehicles.	10	(2 :1: 1.3.1)
	b. Summarize the advantages and disadvantages of EV usage.	10	(2 :1: 1.3.1)
<b><u>Module-2</u></b>			
3.	a. Using sketches, describe six different drivetrain setups found in electric vehicles.	08	(2 :2: 1.3.1)
	b. Discuss EV performance briefly, and explain how the characteristics of the traction motor impact acceleration, speed, and efficiency.	08	(2 :2: 1.3.1)
	c. A battery has a nominal capacity of 40 Ah at the 5 hour discharge rate. Calculate the discharge current, Peukert Coefficient K is 1.2, then what is the Peukert Capacity, & if CR <sub>n</sub> is 40 AH & CS <sub>n</sub> 60 AH ,what is CS <sub>n+1</sub> & CR <sub>n+1</sub> for (n= 1&2) steps and $t_n$ for 1 min & 2 min & what's the DOD for 60 Ah battery.	04	(3 :2: 1.3.1)
(OR)			
4.	a. Explain five performance-related parameters of a battery and compare these for four battery technologies (Li-ion, Lead-acid, NiMH, and Solid-state).	08	(2 :2: 1.3.1)
	b. Discuss how electric vehicle architectures are classified and how they work.	08	(2 :2: 1.3.1)
	c. What is meant by c - rating of a battery? If a 150 Ah battery is rated C5, what would be its discharge current expressed as 0.5C & 2C.	04	(3 :2: 1.3.1)

### **Module-3**

5. a. Explain the general block diagram of a typical electric propulsion system. 10 (2 :3: 1.3.1)  
b. Write in brief the operation principle of a DC Motor with diagram. List the 4 different configurations of DC Motor drives with circuit Diagram. 10 (2 :3: 1.3.1)

**(OR)**

6. a. Briefly explain the control of an induction motor using a DC/AC inverter with sinusoidal PWM. List the advantages of BLDC Motor. 10 (2 :3: 1.3.1)  
b. Describe the general design strategy for the SRM drive, with advantages of using SRM in Electric vehicle. 10 (2 :3: 1.3.1)

### **Module-4**

7. a. Describe how a battery works and explain its charging and discharging characteristics. What factors influence battery performance in electric vehicles? 10 (2 :4: 1.3.1)  
b. Write about ultra-capacitor and fly wheel technology of energy storage systems used in EV with neat diagrams. 10 (2 :4: 1.3.1)

**(OR)**

8. a. Compare major battery technologies based on their specific energy, specific power, energy density, life cycle, self-discharge, cost and application in high-voltage EV systems. 10 (2 :4: 1.3.1)  
b. Explain the working of fuel cell and state its limitations. 10 (2 :4: 1.3.1)

### **Module-5**

9. a. What are the different energy management methods in electric vehicles? Classify and describe them. 10 (2 :5: 1.3.1)  
b. Describe the working principle of a genetic algorithm and outline its basic operational steps. 10 (2 :5: 1.3.1)

**(OR)**

10. a. List the online Energy Management Strategies (EMSs) used in electric vehicles and describe the ECMS approach for battery charge and discharge in hybrid EVs. 10 (2 :5: 1.3.1)  
b. Compare the advantages and disadvantages between different offline EMSs (Energy management strategies) approaches. 10 (2 :5: 1.3.1)

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