

**BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT**

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN Course Code       

Fifth 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.

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<b><u>Module-1</u></b>			
1.	a. Draw a general lay out of an EV (Electric Vehicle) and discuss different subsystems of electric drive train.	10	(2 :1: 1.3.1)
	b. Discuss the benefits of using electric vehicle and hybrid electric vehicle. What are the difficulties in implementing the EVs?	10	(2 :1: 1.3.1)
<b>(OR)</b>			
2.	a. What differences exist between internal combustion engine vehicles with electric hybrid vehicles?	10	(2 :1: 1.3.1)
	b. Distinguish between the electric vehicles based on the electrification levels with respect to voltage, current, speed, and charging time.	10	(2 :1: 1.3.1)
<b><u>Module-2</u></b>			
3.	a. Discuss the architectures of plug in hybrid vehicle in detail.	08	(2 :2: 1.3.1)
	b. Describe the performance of electric vehicle and explain traction motor characteristic	08	(2 :2:1.3.1)
	c. A battery has a nominal capacity of 50 Ah at the 5 hour discharge rate. Calculate the discharge current, Peukert capacity. (Taking K-Peukert coefficient as 1.2).	04	(3 :2: 2.1.2)
<b>(OR)</b>			
4.	a. Explain briefly six different configurations of drivetrains in electric vehicles with neat sketches.	08	(2 :2: 1.3.1)
	b. What is battery modelling, explain with equivalent circuit. Write a MATLAB script to simulate the open circuit voltage for a lead acid battery?	08	(2 :2: 1.3.1)
	c. What is meant by C - rating of a battery? If a 100 Ah battery is rated C5, what would be its discharge current expressed as 0.5C?	04	(3 :2: 2.1.2)
<b><u>Module-3</u></b>			
5.	a. Write brief note on basic operating principle of induction motor with torque–slip characteristics.	08	(2 :3: 1.3.1)
	b. Explain the working of an inverter with sinusoidal Pulse Width Modulation (PWM) method control of induction motor.	08	(2 :3: 1.3.1)

- c. List the four different configurations of DC Motor drives with circuit Diagram. **04** (2 :3: 1.3.1)

(OR)

6. a. Explain the class C two-quadrant operation of chopper control of DC motor drive with suitable waveforms for electric vehicle. **08** (2 :3: 1.3.1)
- b. Describe the general design strategy for the Switched Reluctance Motor (SRM) drive. **08** (2 :3: 1.3.1)
- c. Explain the block diagram of torque control method of BLDC motor. **04** (2 :3: 1.3.1)

**Module-4**

7. a. Classify the energy storage system used in electric vehicle. **07** (2 :4: 1.3.1)
- b. Explain the working principle of battery with charging and discharging characteristics. **07** (2 :4: 1.3.1)
- c. What are factors affecting the performance of batteries used in electric vehicles? **06** (2 :4: 1.3.1)

(OR)

8. a. Explain the working principle of an ultra-capacitor with its features. **07** (2 :4: 1.3.1)
- b. Compare different battery technologies based on their specific energy, specific power and suitability for HV/EHV applications. **07** (2 :4: 1.3.1)
- c. Explain fuel cell and flywheel as energy source elements in HV/EHV vehicle with neat Diagrams. **06** (2 :4: 1.3.1)

**Module-5**

9. a. Explain with the diagram the categorization of the energy management strategies. **08** (2 :5: 1.3.1)
- b. What are the advantages and disadvantages of different online energy management strategies? **04** (2 :5: 1.3.1)
- c. Write about Adaptive Equivalent Consumption Minimization Strategy (A-ECMS) with block diagram? **08** (2 :5: 1.3.1)

(OR)

- 10 a. Explain the Equivalent Consumption Minimization Strategy (ECMS) for charge and discharge of battery in HEV. **08** (2 :5: 1.3.1)
- b. Explain about Model Predictive Control (MPC) method of energy management strategy. **04** (2 :5: 1.3.1)
- c. Explain how the Genetic Algorithm method of EMS is applicable to electric vehicle with flow diagram. **08** (2 :5: 1.3.1)

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