U.S.N.										

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

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 22EE7OE2EV **Max Marks: 100**
Course: ELECTRIC AND HYBRID VEHICLES **Date: 22.02.2023**

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.

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UNIT - I

1	a)	Why Electrification of Transportation is Required? What is the History of electric and Hybrid Electric Vehicles? Explain the causes which had led to the failure of electric vehicles after world war I.	**10**
	b)	What are the different types of pollution caused by IC engine vehicles. Describe each of them in detail.	**10**

UNIT - II

2	a)	With a neat sketch, explain the configuration of parallel hybrid electric drive train	**10**
	b)	With a neat sketch, explain the configuration of Series hybrid electric drive train	**10**

UNIT - III

3	a)	Discuss in detail about the control of permanent magnet motor drives used in EVs	**12**
	b)	Explain the two-quadrant operation of chopper DC motor drive with suitable waveforms for electric vehicle	**08**

UNIT - IV

4	a)	What are the types of Lithium based batteries? Write short notes on any two of them.	**10**
	b)	Discuss the working principle and operation of a Proton Exchange Membrane Fuel Cell (PEMFC). List the advantages and disadvantages	**10**

OR

5	a)	Discuss the basic principle, features and performance of ultracapacitors as a storage device.	**10**
	b)	Describe and compare various Nickel based batteries?	**10**

UNIT - V

6 a) Describe any two control strategies used in series hybrid electric drive train. **10**

b) Elaborate the process involved in designing energy storage for a parallel hybrid drive train. **10**

OR

7 a) With the help of a neat diagram describe the configuration of the parallel torque-coupling hybrid drive train **08**

b) Design a series hybrid electric drive train with the following specifications. **12**

Vehicle total mass: 1500 kg
Rolling resistance coefficient: 0.01
Aerodynamic drag coefficient: 0.3
Front area: 2.0 m^2
Transmission efficiency (single gear): 0.9
Acceleration time (from 0 to 100 km/h): 10±1 sec
Maximum gradeability: >30% at low speed and >5 at 100 km/h
Maximum speed: 160 km/h

List all the design steps and estimate gear ratio, power capacity and energy capacity

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