U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: VII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 22EE7OE2EV **Max Marks: 100**
Course: Electric and Hybrid Vehicles

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.

		UNIT - I	CO	PO	Marks
1	a)	What is global warming? What are the adverse effects of it?	CO1	PO1	**06**
	b)	What are the causes and side effects of air pollution?	CO1	PO2,7	**08**
	c)	Briefly illustrate the history of Electric Vehicles	CO1	PO7	**06**
		UNIT - II			
2	a)	Draw the Traction Motor Characteristics of a variable-speed electric motor drives. Discuss the regions of operation	CO2	PO2	**08**
	b)	With a neat diagram, discuss the configuration and operating modes of a Series Hybrid Electric drive trains.	CO2	PO2	**12**
		UNIT - III			
3	a)	Explain the construction and working of a BLDC motor.	CO4	PO2	**08**
	b)	Draw the basic magnetic structure of an SRM drive. Derive the torque expression of an SRM motor.	CO4	PO2	**12**
		UNIT - IV			
4	a)	Explain the importance of energy density and power density in the context of electric vehicle batteries.	CO3	PO2	**08**
	b)	Describe the working principles of lithium-ion batteries, highlighting their advantages and limitations.	CO3	PO2	**12**
		OR			
5	a)	What is the working principle of Hydrogen air fuel cell? Draw and explain the Cell voltage, system efficiency, and net power density varying with net current density of a hydrogen–air fuel cell.	CO3	PO2	**10**
	b)	Discuss the working principle and operation of a Proton Exchange Membrane Fuel Cell (PEMFC). List the advantages and disadvantages	CO3	PO2	**10**

			UNIT - V			
	6	a)	Describe the operating patterns of a series hybrid electric drivetrains	*CO4*	*PO2*	**10**
		b)	Describe briefly the design considerations for designing the following parameters of a parallel hybrid electrical drivetrain i. Engine power design ii. PPS design	*CO4*	*PO2*	**10**
			OR			
	7	a)	Draw and explain the overall control scheme of parallel torque-coupling hybrid drivetrain.	*CO4*	*PO2*	**10**
		b)	Design a series hybrid electric drive train with the following specifications. 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	*CO4*	*PO2*	**10**

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