Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Seventh Semester

AUTOMOBILE ENGINEERING

U18AUT7003: Hybrid and Electric Vehicles

COURSE OUTCOMES

CO1: Describe the configuration of hybrid and electric vehicles.

CO2: Identify the basic components of hybrid and electric vehicles.

CO3: Assess the characteristics and performance of the electric vehicle

CO4: Select suitable electric propulsion and control systems for HEV.

CO5: Choose proper energy storage systems for vehicle applications

CO6: Describe the operation of fuel cell and solar cell vehicles.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	Illustrate the concept of regenerative braking in hybrid and electric vehicles.	CO4	[K_2]
2.	Explain the factors influencing propulsion motor's performance.	CO4	[K_2]
3.	Interpret the speed torque characteristics of a dc motor.	CO3	[K_2]
4.	Assess the socio-environmental impact of electric vehicles in the transportation sector.	CO3	[K_2]
5.	Identify the battery storage requirements of a hybrid electric vehicle.	CO5	[K_2]
6.	Classify the different types of automotive batteries and suggest a suitable battery for vehicular application. Justify the selection.	CO5	[K_2]
7.	Specify any two hybrid electric vehicles available in the market with clear specification of the components.	CO2	[K_2]
8.	Explain the challenges posed while using fuel cell powered vehicles.	CO6	[K_3]
9.	List some of the solar tracking methods employed in vehicles and explain how it affects the performance of photovoltaic cells.	CO6	[K_2]
10.	Highlight the significance of power flow control in hybrid drive-train topology.	CO1	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Compare an induction motor drive with a permanent magnet motor drive based on the construction, working, types of control employed and its applications.	8	CO4	[K_3]
	b)	Illustrate the working of a buck and boost converters in HEVs.	8	CO3	[K_2]
12.		Choose an ideal energy storage system for e-mobility applications and elaborate on the working with proper justifications.	16	CO5	[K_2]
13.		Identify the different architectures of hybrid electric drivetrain with clear explanation on the different modes of operation, advantages and disadvantages and power flow control adopted in the drive train.	16	CO1	[K_2]
14.		Analyze the layout of Electric Vehicle (EV) and explain the purpose of various components used in an EV. Also explain the components and choice for an Electric Vehicle.	16	CO2	[K_4]
15.		Design a series-parallel hybrid electric drive train clearly highlighting the disadvantages of series and parallel drive train. Apply the concept of (i) Gradeability (ii) Force due to Rolling resistance (iii) Drag force to an electric vehicle Determine the performance of the vehicle based on these parameters. Also explain the speed torque characteristics.	16	CO4	[K_3]
16.		Apply the concept of energy conversion to Alkaline fuel cell with neat sketch and electrochemical equations. Also give the advantages, disadvantages and applications.	16	CO6	[K_3]

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