



B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Seventh Semester

Electronics and Instrumentation Engineering

U18EIE0021:Hybrid and Electric Vehicles

COURSE OUTCOMES

- CO1:** Identify the basic components of hybrid and electric vehicles
- CO2:** Assess the characteristics and performance of the electric vehicle and select suitable electric propulsion and control systems for HEV
- CO3:** Choose proper energy storage systems for vehicle applications
- CO4:** 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)**

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| 1. Define regenerative braking? | CO2 [K ₂] |
| 2. List the social importance of electric mobility. | CO1 [K ₂] |
| 3. List the types of batteries | CO3 [K ₂] |
| 4. Short note on social and environmental importance of hybrid vehicles. | CO1 [K ₂] |
| 5. Define state of charge and state of discharge | CO3 [K ₃] |
| 6. Short note on solid oxide solar cell. | CO4 [K ₂] |
| 7. List out the drive systems required for EV and HEV | CO2 [K ₂] |
| 8. Short note on efficiency of solar Vehicles. | CO4 [K ₂] |
| 9. Short note on battery pack system. | CO3 [K ₂] |
| 10. Define the terms Maximum speed and Grade ability of HEV. | CO1 [K ₂] |

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

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| 11. a) Explain the characteristics of electrochemical energy conversion of fuel cell with a neat sketch. | 8 CO4 [K ₃] |
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	b)	List the merits and challenges of Hybrid vehicles.	8	CO1	[K ₂]
12.	a)	Explain in detail about the switch reluctance motor drive system used in Hybrid and Electric vehicles with a neat sketch.	8	CO2	[K ₃]
	b)	Illustrate the operation of battery management system with a suitable sketch.	8	CO3	[K ₂]
13.	a)	Elaborate about the power electronic converters for HEV with a neat diagram	8	CO2	[K ₃]
	b)	Explain in detail about the battery characterization with neat sketch.	8	CO3	[K ₃]
14.	a)	Illustrate the working of Ultra capacitors with a neat sketch.	8	CO2	[K ₃]
	b)	Discuss the operation and properties of Fuel cells with a suitable sketch.	8	CO4	[K ₃]
15.	a)	Analyze the concept of fuel efficiency in Electric vehicle and provide a step-by-step derivation for calculating it.	8	CO1	[K ₃]
	b)	Compare ICEV with HEV.	8	CO1	[K ₃]
16.	a)	Enumerate the operation of direct methanol Fuel cell with suitable sketch.	8	CO4	[K ₃]
	b)	Illustrate the operation of Hybrid electric drive train configurations with a suitable sketch.	8	CO1	[K ₃]
