Reg. No.																

Question Paper Code	14352

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Seventh Semester

Electrical and Electronics Engineering

20EEPC702 - ELECTRIC VEHICLES

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	Which type of electric vehicle relies solely on electricity and does not have an internal combustion engine? a) Battery Electric Vehicle (BEV) b) Plug-in Hybrid Electric Vehicle (PHEV) c) Hybrid Electric Vehicle (HEV) d) Fuel Cell Electric Vehicle (FCEV)	1	K1	CO1
2.	What is the term used for the energy efficiency of an electric vehicle, measured in miles (or kilometers) driven per unit of energy consumed (e.g., miles per kilowatt-hour)? a) Energy density b) Energy efficiency c) Range anxiety d) Electric vehicle efficiency	1	K2	CO1
3.	An electric vehicle manufacturer is developing a new model that aims to provide extended range and fast acceleration. They want a drive train that can deliver high power output and optimize the efficiency of the internal combustion engine. Which drive train architecture should they consider for their vehicle? a) Series hybrid b) Parallel hybrid c) Mild hybrid d) Micro hybrid	1	K1	CO1
4.	Which parameter is often used to evaluate the performance of a PEMFC through modeling? a) Voltage drop b) Open circuit voltage c) Faradaic efficiency d) Mass transfer coefficient	1	K1	CO2
5.	Which of the following is the electrolyte used in a lead-acid battery? a) Nitric acid b) sulphuric acid c) lead-acid d) Hydrochloric acid	1	K2	CO2
6.	In ideal case the charging time for 200Ah battery would be a) 5 hours b) 10 hours c) 15 hours d) 20 hours	1	K2	CO2
7.	Which type of DC motor is commonly used in electric vehicles? a) Series-wound DC motor b) Shunt-wound DC motor c) Permanent magnet DC motor d) Compound-wound DC motor	1	K1	CO3
8.	Which component is responsible for converting AC power from the grid to DC power for charging the battery in an electric vehicle? a) Inverter b) Charger c) Battery pack d) Motor	1	K1	CO3
9.	The speed of an SRM can be controlled by adjusting the _____ a) Stator current b) Rotor position c) Voltage applied to the stator d) Voltage applied to the rotor	1	K2	CO3

10. What is the primary purpose of determining the electric motor drive capacity in a parallel hybrid electric drive train? *1 K2 CO4*
    a) To select the vehicle's color
    b) To optimize the transmission type
    c) To ensure the battery pack is large enough
    d) To provide electric propulsion and assist the internal combustion engine (ICE)
11. What is the primary purpose of determining the engine power capacity in a parallel hybrid electric drive train? *1 K3 CO4*
    a) To select the vehicle's color
    b) To optimize the transmission type
    c) To ensure the battery pack is large enough
    d) To achieve the desired acceleration and performance
12. How does the engine power capacity affect the vehicle's overall fuel consumption in highway driving for a parallel hybrid? *1 K3 CO4*
    a) Higher engine power capacity reduces fuel consumption on highways**.**
    b) Engine power capacity has no impact on fuel consumption on highways.
    c) Lower engine power capacity generally leads to improved fuel efficiency on highways.
    d) It determines the tire pressure
13. In a Z-Converter design, what is the role of the capacitors? *1 K3 CO5*
    a) To regulate the switching frequency
    b) To store energy and smooth the output voltage
    c) To control the bidirectional power flow
    d) To provide isolation to the battery
14. What is the primary difference between constant current (CC) and constant voltage (CV) charging methods? *1 K3 CO5*
    a) CC charges the battery slowly, while CV charges it quickly.
    b) CC maintains a steady current, while CV maintains a constant voltage
    c) CC is only suitable for lead-acid batteries, while CV is for lithium-ion batteries
    d) CC and CV are two terms for the same charging method
15. In an isolated bidirectional DC-DC converter, what role does the transformer play, and why is it necessary? *1 K3 CO5*
    a) The transformer stores energy for bidirectional power flow.
    b) The transformer provides electrical isolation between input and output
    c) The transformer regulates the voltage output.
    d) The transformer reduces the switching frequency
16. What is the purpose of the switching device in a Z-Converter? *1 K3 CO5*
    a) To increase transformer size
    b) To smooth the output voltage
    c) To control power conversion through switching action
    d) To provide mechanical rotation

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)

Answer ALL Questions

17. E Explain the major challenges involved in the implementation of Hybrid Electric Vehicles (HEVs) and Electric Vehicles (EVs). *3 K3 CO1*
18. Illustrate the desired features and performance characteristics of motors used in electric vehicles. *3 K3 CO1*
19. Compare and analyze the performance, efficiency, lifespan, and environmental impact of lithium-ion batteries and conventional batteries. *3 K4 CO2*
20. Analyze the operational limitations of fuel cells and their impact on the performance of electric vehicles. *3 K4 CO2*
21. Compare the advantages of Plug-in Hybrid Electric Vehicles (PHEVs) over Hybrid Electric Vehicles (HEVs). *3 K3 CO3*

22.		List and explain the various types of hybrid electric drive trains used in modern vehicles.	*3*	*K3*	*CO4*
23.		Illustrate the advantages of using a high-frequency transformer for isolation when compared to a traditional low-frequency transformer.	*3*	*K3*	*CO4*
24.		Design and analyze the capacitor and inductor parameters of a Z-converter for a specified operating condition.	*3*	*K4*	*CO5*

PART - B (Descriptive Answer Questions)

(5 × 12 = 60 Marks)

Answer ALL Questions

25.	a)	Explain the performance characteristics of electric vehicles and calculate the tractive effort required under normal driving conditions.	*12*	*K3*	*CO1*
		OR			
	b)	Illustrate the architecture and operation of Series and Parallel Hybrid Electric Drive Trains with suitable diagrams.	*12*	*K3*	*CO1*
26.	a)	Compare and analyze the working principles, performance, and applications of various energy storage systems.	*12*	*K4*	*CO2*
		OR			
	b)	Analyze the role of Supercapacitors in improving power density, regenerative braking efficiency, and vehicle performance in Electric Vehicles.	*12*	*K4*	*CO2*
27.	a)	Explain the configuration and control of electric propulsion systems such as DC motor drives, induction motor drives, and PM motor drives used in EV applications.	*12*	*K3*	*CO3*
		OR			
	b)	Sketch the structure of the controller for the PMBLDC motor and explain the functions of various blocks.	*12*	*K3*	*CO3*
28.	a)	Analyze the design and control strategies of Series Hybrid Electric Drive Trains with respect to sizing of major components and operating patterns.	*12*	*K3*	*CO4*
		OR			
	b)	Explain how the traction motor is designed for HEV with examples.	*12*	*K3*	*CO4*
29.	a)	Analyze the operation of Z-source converters and isolated bidirectional DC–DC converters used in EV battery charging systems.	*12*	*K4*	*CO5*
		OR			
	b)	Compare various types of battery charging methods.	*12*	*K4*	*CO5*