Reg. No.															

Question Paper Code	13421

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Seventh Semester

Electrical and Electronics Engineering

20EEPC702 - ELECTRIC VEHICLES

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	What is the approximate charging time for a fast-charging station to charge an electric vehicle to 80% capacity? (a) 5 minutes (b) 30 minutes (c) 1 hour (d) 8 hours	*1*	*K1*	*CO1*
2.	Which type of electric vehicle has both an electric motor and an internal combustion engine? (a) Battery Electric Vehicle (BEV) (b) Hybrid Electric Vehicle (HEV) (c) Plug-in Hybrid Electric Vehicle (PHEV) (d) Fuel Cell Electric Vehicle (FCEV)	*1*	*K1*	*CO1*
3.	What will be the C-rate of a battery with capacity of 15 kWh if it discharges power at 30 kW in 30 min? (a) 0.1C **(**b) 0.2 C (c) 0.4C (d) 0.3C	*1*	*K1*	*CO2*
4.	Super capacitors in electric vehicles are primarily used for_____ (a) Energy storage (b) Power delivery (c) Both energy storage and power delivery (d) Temperature regulation	*1*	*K1*	*CO2*
5.	Which of the following is a key consideration when choosing an electric vehicle (EV)? (a) Battery range (b) Engine size (c)Fuel efficiency (d) Transmission type	*1*	*K1*	*CO3*
6.	Which control method allows for precise control of the motor's speed and torque? (a) Closed-loop control (b) Open-loop control (c) Feedback control (d) On-off control	*1*	*K1*	*CO3*
7.	In a series hybrid, how do control strategies interact with the power rating of the engine/generator? (a) Control strategies have no impact on the engine/generator's power rating. (b) Control strategies can adjust the engine/generator's power output as needed. (c) Control strategies determine the vehicle's color based on engine power. (d) The power rating of the engine/generator determines control strategy.	*1*	*K1*	*CO4*
8.	How does the power rating of the engine/generator impact the range of a series hybrid vehicle? (a) A higher power-rated engine/generator increases the range. (b) The power rating has no effect on the vehicle's range. (c) A lower power-rated engine/generator extends the range. (d) It determines the tire pressure.	*1*	*K1*	*CO4*
9.	What is the significance of soft-switching techniques in the operation of a Z-Converter? (a) Soft-switching techniques eliminate the need for a transformer. (b) They reduce voltage stress on components but increase switching losses. (c) Soft-switching techniques minimize switching losses and improve overall efficiency. (d) They increase the complexity of the control	*1*	*K1*	*CO5*
10.	In an isolated bidirectional DC-DC converter, what role does the transformer play, and why is it necessary? (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	*1*	*K1*	*CO5*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.		Define Hybridization ratio.	2	K1	CO1
12.		Why do we need hybrid vehicles?	2	K1	CO1
13.		Mention three disadvantages in electric cars.	2	K1	CO1
14.		What are the common problems associated with lead acid batteries?	2	K1	CO2
15.		Define specific energy of the battery.	2	K1	CO2
16.		Mention limitations of fuel cells.	2	K1	CO2
17.		Summarize the advantages of PMBLDC motors.	2	K2	CO3
18.		What are the factors on which the sizing of electric motors for electric vehicles depends?	2	K1	CO3
19.		Show the difference between hybrid and plug-in hybrid.	2	K2	CO4
20.		Outline the block diagram of series hybrid drive train.	2	K2	CO4
21.		Define the concept of constant current charging method.	2	K1	CO5
22.		Outline the applications of isolated bidirectional DC-DC converters.	2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the major components of an electric vehicle with the help of a block diagram.	11	K2	CO1
		OR			
	b)	Elucidate the different configurations of drive trains in electric vehicles.	11	K2	CO1
24.	a)	Enlighten the working principle of a fuel-cell and its analysis.	11	K2	CO2
		OR			
	b)	Illustrate and infer the details about PEM fuel cell.	11	K2	CO2
25.	a)	Outline the structure of the controller for the PMBLDC motor and explain the functions of various blocks.	11	K2	CO3
		OR			
	b)	Explicate the microprocessor based control of the switched reluctance motor with a neat block diagram.	11	K2	CO3
26.	a)	Explain architecture and power flow control of parallel HEV.	11	K2	CO4
		OR			
	b)	Demonstrate the extended configuration of a series hybrid electric drive train with six modes of operation.	11	K2	CO4
27.	a)	Summarize the two control strategies of Z converter topology.	11	K2	CO5
		OR			
	b)	Explain the operation of transformer-less charger topology used in EV charging.	11	K2	CO5
28.	a) (i)	Outline the flowchart of control strategy of series Hybrid drive train.	6	K2	CO4
	(ii)	Outline any one type of battery charging method.	5	K2	CO5
		OR			
	b) (i)	Illustrate the difference between series and parallel hybrid.	6	K2	CO4
	(ii)	Demonstrate the operating principles of a full-bridge isolated bi-directional DC-DC converter.	5	K2	CO5