K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:VI
Class:TY	Program:B.Tech
Branch Code:MEC	Pattern:2022
Name of Course:Introduction to Electric Vehicles	Course Code:MEC223021
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains ___02__page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Explain various power flow configurations (Operation modes) that are available in hybrid vehicles.	(6)	CO1
Question No. 2			
2a)	Analyze the global trends in electric vehicle (EV) adoption and growth forecasts for 2026. Highlight the key drivers influencing these trends.	(6)	CO1
Question No. 3			
3a)	a) Explain with neat sketch various battery cooling methods used in electric vehicles	(8)	CO1, CO2
	OR		
3b)	Write a note on battery lifecycle and recycling management.	(8)	CO1, CO2
3c)	The output voltage and current drawn by motor is 72 Volt and 7 Amp. Consider 5% extra current drawn during acceleration. Assuming Battery discharging efficiency = 85 %, Calculate battery pack capacity for a two-wheeler with range of 160 km and Gross weight of 240 kg running at a speed of 30 Km/hr.	(8)	CO1, CO2
	OR		
3d)	A 240 kg electric two-wheeler vehicle for a speed of 60 Km/hr on a flat road with rolling resistance coefficient of 0.004 and coefficient of drag of 0.88. Assume density of air =1.2 kg/m^3 and frontal area =1 m^2. Take Motor efficiency =80 % and Battery discharging efficiency= 85 %. Calculate battery pack capacity required to propel the vehicle.	(8)	CO1, CO2
Question No. 4			
4a)	Explain the differences between Level 1, Level 2, and DC Fast Charging (Level 3) stations. How do they impact charging time, vehicle compatibility, and installation cost?	(8)	CO3, CO4
	OR		

4b)	Discuss how large-scale electric vehicle charging affects grid infrastructure. What are smart charging solutions, and how does vehicle-to-grid (V2G) technology help mitigate these impacts?	(8)	CO3, CO4
4c)	Describe the types of connectors and charging standards used for electric vehicles globally. How do different standards affect EV compatibility and infrastructure development?	(8)	CO3, CO4

OR

4d)	What are the major challenges faced in deploying public EV charging stations? Suggest strategies to overcome these challenges for faster infrastructure growth	(8)	CO3, CO4

Question No. 5

5a)	What role do autonomous electric vehicles (AEVs) play in the future automotive market? Discuss their advantages, challenges, and expected impact on urban mobility.	(8)	CO3, CO4

OR

5b)	Explain recent advances in battery technology and energy storage that are accelerating electric vehicle (EV) adoption. Provide examples of new battery chemistries and their advantages.	(8)	CO3, CO4
5c)	Describe the role of electric vehicles (EVs) in smart cities and modern transportation networks. How does renewable energy integration enhance the effectiveness of EV-based smart transportation?	(8)	CO3, CO4

OR

5d)	Discuss the role of wireless charging technologies for electric vehicles. What are their advantages, limitations, and future prospects in urban transportation systems?	(8)	CO3, CO4

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