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Fifth Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026 Fundamentals of Electrical Vehicles

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
1	a.	What are the different fuels used in automobile and pollutant formation form fuels?	4	L1	CO1
	b.	Discuss carbon emissions for conventional and electric powertrain in brief.	6	L2	CO1
	c.	Illustrate green house gases formation by the pollutants and its effects on living things.	10	L3	CO1
OR					
2	a.	Describe conventional internal combustion engine working with the help of diagram.	4	L1	CO1
	b.	Discuss battery electric vehicle operation with neat diagram.	6	L2	CO1
	c.	With the help of block diagram illustrate series hybrid electric vehicle and parallel hybrid electric vehicle.	10	L3	CO1
Module – 2					
3	a.	Briefly describe about forces acting on a vehicle in motion.	4	L1	CO2
	b.	Discuss aerodynamic drag and rolling resistance in vehicle.	6	L2	CO2
	c.	Interpret effect of auxiliary loads on range gradability, vehicle acceleration.	10	L3	CO2
OR					
4	a.	List and explain traction motor characteristics.	4	L1	CO2
	b.	Explain regenerative braking of vehicle.	6	L2	CO2
	c.	An electric vehicle has the following attributes : i. Mass $m = 500 \text{ kg}$ ii. Wheel radius $r = 0.3 \text{ m}$ iii. Gear ratio from rotor to drive axle $n_g = 10$ iv. And a nominal gear efficiency $\eta_g = 95\%$ The vehicle is required to accelerate linearly from 0 to 36 km/hr in 5 s on a flat road surface under calm wind conditions neglecting load forces, instantaneously at 18 km/hr. Calculate the electromagnetic torque from the electric motor to achieve this acceleration torque.	10	L3	CO2
1 of 2					

Module – 3

5	a.	List and explain the factors to consider while selection of battery pack.	4	L1	CO3
	b.	Explain construction and working of lead-acid battery with neat sketch.	6	L2	CO3
	c.	With neat diagram, illustrate lithium-ion and Nickel metal hydride battery.	10	L3	CO3

OR

6	a.	Briefly explain battery failure and protection in electric vehicle.	4	L1	CO3
	b.	Explain the functions of battery management system.	6	L2	CO3
	c.	Illustrate the following : i. Battery electric vehicle battery sizing ii. Battery pack discharge curves and aging.	10	L3	CO3

Module – 4

7	a.	Define the following with respect to traction motors : i. Rated torque ii. Rated and base speeds.	4	L1	CO3
	b.	With neat sketch, explain working of AC motor.	6	L2	CO3
	c.	Examine operation of DC generator with neat diagram.	10	L4	CO3

OR

8	a.	List the factors to be considered while selecting traction motors for EV application.	4	L1	CO3
	b.	Explain constant power mode in characteristics curves of a machine.	6	L2	CO3
	c.	Examine characteristics curves of machine with following mode : i. Constant Torque Mode ii. Maximum-speed Mode.	10	L4	CO3

Module – 5

9	a.	What are the challenges and solutions for hydrogen storage systems?	4	L1	CO4
	b.	Briefly explain about fuel cell model and cell voltage.	6	L2	CO4
	c.	With a neat sketch, illustrate structure and working of fuel cell.	10	L3	CO4

OR

10	a.	Write a brief account on fuel cell characteristics.	4	L1	CO4
	b.	Discuss Hybrid Electric Vehicle with neat diagram.	6	L2	CO4
	c.	Examine working of fuel cell vehicle with block diagram.	10	L4	CO4
