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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80014

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025
Seventh Semester
Electrical and Electronics Engineering
U19EEV23 – ELECTRICAL AND HYBRID VEHICLES
(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define <i>tractive effort</i> in the context of electric vehicles.	2	K1	CO1
2.	List any two differences between conventional IC vehicles and EVs in terms of performance.	2	K2	CO1
3.	State the operating principle of an Internal Combustion (IC) engine.	2	K1	CO2
4.	List out the transmission characteristics.	2	K1	CO2
5.	Define a <i>series hybrid electric drive train</i> .	2	K1	CO3
6.	In a design example, if the traction motor is required to provide 80 Nm torque at 1500 rpm, calculate the power rating of the motor.	2	K2	CO3
7.	Differentiate between <i>parallel</i> and <i>series-parallel</i> hybrid drive trains (any two points).	2	K2	CO4
8.	State one advantage of a Plug-in Hybrid Electric Vehicle (PHEV) compared to a conventional HEV.	2	K2	CO4
9.	Define <i>regenerative braking</i> in electric vehicles.	2	K1	CO5
10.	If a vehicle of 1000 kg mass decelerates from 20 m/s to rest, calculate the total kinetic energy available for regeneration.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Analyze the effect of vehicle mass and road gradient on the tractive effort required for an electric vehicle.	13	K2	CO1

(OR)

	b)	Explain rolling resistance and aerodynamic drag in vehicles.	13	K2	CO1
12.	a)	Apply the torque–speed characteristics of an induction motor to determine its suitability for electric vehicle propulsion.	13	K3	CO2
		(OR)			
	b)	Analyze the performance trade-offs between BLDC and SRM drives for hybrid electric vehicles.	13	K3	CO2
13.	a)	Define a series hybrid electric drive train with a neat block diagram.	13	K1	CO3
		(OR)			
	b)	Describe the impact of different control strategies on the fuel consumption of a series hybrid system.	13	K2	CO3
14.	a)	Analyze how torque and speed coupling affect the overall efficiency of a series–parallel hybrid drive train.	13	K3	CO4
		(OR)			
	b)	Explain a suitable configuration of a plug-in hybrid drive train for urban application.	13	K3	CO4
15.	a)	Apply the concept of regenerative braking to calculate the braking energy recoverable when a 1200 kg vehicle slows down from 25 m/s to 10 m/s (ideal case).	13	K3	CO5
		(OR)			
	b)	Evaluate the limitations of regenerative braking in heavy traffic urban conditions.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	A city transport authority plans to replace its fleet of 200 diesel buses with electric or hybrid electric buses. As an engineer, analyse the following aspects: <ul style="list-style-type: none"> • Energy consumption and charging infrastructure requirements. • Environmental and economic impacts. • Suitability of electric vs. hybrid configurations for urban stop-and-go operation. 	15	K3	CO2
	(OR)			
b)	A city transport authority plans to replace its fleet of 200 diesel buses with electric or hybrid electric buses. Design a conceptual model for a plug-in hybrid bus system for the same fleet. Your design should address: <ul style="list-style-type: none"> • Drive train configuration. • Power rating of traction motor and energy storage system. • Regenerative braking integration. • Strategies to minimize fuel consumption and emissions. 	15	K3	CO4