

Enroll No

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to SUK)
Mid-Sem Exam (MSE) (2025-26)

Q.P. Code
M 38

Final Year B.Tech. Electrical Engineering

Course Code: EE413

Course Name: Electrical Vehicle

Day & Date: Friday 19/09/2025

Time: 10:15 To 12:15

Max Marks- 50

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas, figures in the first right column indicate total marks for that whole question.
 - 3) CO is the index number of the Course Outcome statement.
 - 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
 - 5) Assume suitable data if necessary.
 - 6) Use of non-programmable calculators is allowed

		Marks	BT Level	COs
Q.1	A Explain any two of the following types of electric vehicles	08	2	1
	i. Pure EV			
	ii. Hybrid EV			
	iii. Plug-In Hybrid EV			
	iv. Fuel-Cell EV			
	B Discuss the major challenges in EV development and how EV technologies overcome them.	08	3	1
Q.2	A Derive the equation for total tractive force and explain the different longitudinal resistance components acting on an EV.	08	3	2
	B A 1600 kg electric car travels on a road with a 3° uphill gradient at a steady speed of 100 km/h. The vehicle frontal area is 2.2 m ² , aerodynamic drag coefficient C _d = 0.32, rolling resistance coefficient C _{rr} = 0.01. Air density is ρ = 1.225 kg/m ³ . Neglect wind i.e. wind speed = 0. Calculate the aerodynamic drag force, rolling resistance force, grading (incline) force, and the total resistive force acting on the vehicle (in N).	09	4	2
	OR			
	B An EV is fitted with a battery pack of 350 V, 120 Ah. The vehicle's average propulsion power at cruise is 15 kW when traveling at 60 km/h. Auxiliary loads consume 500 W at the same time. Overall energy conversion efficiency is 88%. Calculate Battery pack energy in kWh, Total average energy consumption in Wh/km, Vehicle range in km on a single full charge.	09	4	2



		Marks	BT Level	COs
Q.3	A Compare the characteristics of DC motor, BLDC motor, and Switched Reluctance Motor for EV propulsion applications.	08	2	3
	OR			
	A Explain with neat diagrams the construction and working of a Switched Reluctance Motor (SRM) used in EVs.	08	2	3
	B A Permanent Magnet Synchronous Motor (PMSM) rated at 60 kW is used in an EV. Explain its operating principle with equations and discuss why it is preferred over a DC machine in modern EVs.	09	4	3

