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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (S,FE) (FT/PT) Examinations September 2026 (2019 Scheme)

Course Code: EET418
Course Name: ELECTRIC AND HYBRID VEHICLES

Max. Marks: 100 **Duration: 3 Hours**

PART A
Answer all questions, each carries 3 marks.

		Marks
1	Explain the significance of automation in vehicles.	(3)
2	Describe any three types of resistive forces that act against the motion of a vehicle.	(3)
3	With neat block diagrams explain the working of a series hybrid drive train.	(3)
4	What factors influence fuel efficiency in electric drive-trains?	(3)
5	What are the advantages of using DC drives in electric vehicle propulsion?	(3)
6	How does sensor-based control differ from sensor less control in PMSM drives?	(3)
7	Why is energy storage important in hybrid and electric vehicles?	(3)
8	What are the different types of EV charging stations?	(3)
9	Why is sizing of power electronics crucial in electric vehicle drive systems?	(3)
10	How does the LIN communication protocol differ from CAN in terms of functionality and application?	(3)

PART B
Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Describe the basic layout of an electric vehicle using a block diagram.	(8)
	b)	What is the significance of hybrid and electric vehicles in terms of social and environmental impact?	(6)

OR

12	a)	Derive a mathematical model to describe vehicle performance.	(10)
	b)	Explain the ideal torque-speed characteristics required for an Electric/hybrid vehicle power plant.	(4)

Module II

13	a)	What are the different hybrid drive-train topologies, and how do they function?	(8)
	b)	Describe in detail the components and operation of the electric traction system.	(6)

OR

14 a) Explain the different power flow control modes of a typical series parallel hybrid EM dominated system with the help of block diagram. (8)

b) Explain in detail the EV drivetrain alternatives based on power source configurations (6)

Module III

15 a) Describe the working principle of a DC motor and explain the concept of closed-loop control for speed and torque regulation with a block diagram (10)

b) List the advantages of PMSM motors over DC and induction motors (4)

OR

16 a) List the advantages of FOC control. (4)

b) Draw and explain the block diagram of sensor less Field Oriented Control in PMSM drive. (10)

Module IV

17 a) Describe the role of a Battery Management System (BMS) in hybrid and electric vehicles (6)

b) Explain the operation of fuel cell. List out the merits and demerits (8)

OR

18 a) Discuss the working principle and characteristics of supercapacitors. How do they differ from conventional batteries, and what role do they play in electric vehicle energy storage? (10)

b) How do on-board chargers differ from off-board chargers in electric vehicles? (4)

Module V

19 a) Explain the sizing constraints of electrical motor used EV/EHV (8)

b) Explain the basics of the CAN communication protocol. Why is it widely used in electric vehicles? (6)

OR

20 a) What does CP and PP pins denote in connectors and explain its functions. (8)

b) Explain the significance of Power Line Communication used in EV (6)

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