

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (R,S) Examination November 2025 (2019 Scheme).

Course Code: EET445**Course Name: ELECTRIC VEHICLES****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.*

Marks

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|----|---|-----|
| 1 | Explain the vehicle power plant characteristics. | (3) |
| 2 | What are the factors rolling resistance coefficient depends on? | (3) |
| 3 | Sketch the functional block diagrams of a series hybrid drive train | (3) |
| 4 | What are the various modes of operation in power flow control of series hybrid drive train? | (3) |
| 5 | Explain the various speed control methods of Induction motors. | (3) |
| 6 | Explain the advantages and limitations of using DC motors in the drivetrain of electric and hybrid electric vehicles. | (3) |
| 7 | Define specific energy and specific power ratings of the energy storage system employed in electric vehicles | (3) |
| 8 | Define the role of flywheels in electric vehicles | (3) |
| 9 | Explain the necessity of a communication network in electric/hybrid vehicles | (3) |
| 10 | Explain the significance of energy management strategies in hybrid electric vehicles | (3) |

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

- 11 a) List out and explain the various forces acting on a vehicle climbing a slope with suitable equations. (14)

OR

- 12 a) Compare the performance characteristics of an electric motor and internal combustion engine with the ideal performance characteristics of vehicle power plant with suitable diagrams. (14)

Module II

- 13 a) Briefly explain the various drivetrain configurations that can be implemented in hybrid vehicles with necessary diagrams (14)

OR

- 14 a) What are the reasons for considering EV more flexible compared to HEV. ? (4)
b) Explain in detail the general configuration of EV with suitable diagrams (10)

Module III

- 15 a) Explain in detail about the various electrical components used in hybrid and electric vehicles (9)
b) Explain the armature voltage control and field weakening mode control of DC separately excited motor drive system. (5)

OR

- 16 a) Explain the working of a two-quadrant and four quadrant choppers with suitable diagrams (14)

Module IV

- 17 a) Explain the operation of fuel cell with necessary equations. List out the merits and demerits (10)
b) Define C rating of a battery. If a 150Ah battery is rated C_{10} , what would be its discharge current expressed as $0.75C_{10}$ (4)

OR

- 18 a) Compare super capacitor and fuel cell as energy source elements in electric and hybrid electric vehicle. (14)

Module V

- 19 a) List down and explain types of communication networks based on speed and application in vehicles. (7)
b) Elucidate the CAN layout in a HEV with the help of a block diagram (7)

OR

- 20 a) Briefly explain and compare the rule-based and optimisation-based energy management strategies employed in hybrid electric vehicles (14)
