

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree 7th semester (S,FE) Exam April 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 why multi-gear transmission system is required for IC Engine based vehicles. | (3) |
| 2 | What are the forces that retard the motion of a four-wheel vehicle? | (3) |
| 3 | Discuss the energy saving potential of hybrid electric vehicle. | (3) |
| 4 | With help of block diagram explain the different subsystems in an electric vehicle. | (3) |
| 5 | How does DC drive is operated in regenerative braking mode? | (3) |
| 6 | How the electric motors used in EVs differs from that of used in industrial application? | (3) |
| 7 | Explain the terms specific energy and specific power as applied to batteries. | (3) |
| 8 | What is meant by C- rating of a battery? If a 150Ah battery is rated C_{10} , what would be its discharge current expressed as $0.5C_{10}$? | (3) |
| 9 | Why an energy management control system is required in an HEV? | (3) |
| 10 | What is a Controller Area Network? | (3) |

PART B

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

Module I

- 11 a) Derive the dynamic equation to determine the maximum tractive effort in a passenger car. (14)

OR

- 12 a) Explain social and environmental impact of hybrid electric vehicle. (7)
b) Explain the history of Hybrid Electric Vehicles. (7)

Module II

- 13 a) Draw and explain architecture and power flow control of series parallel hybrid electric vehicle. (14)

OR

- 14 a) Draw and explain architecture and different modes for Power Flow Control in Complex Hybrid vehicle (14)

Module III

- 15 a) With the help of neat figures explain the general configuration of constant v/f control of induction motors. (7)
- b) Comment on the suitability of DC and AC machines for electric and hybrid electric vehicle applications. (7)

OR

- 16 a) Explain the Field Oriented Control of Induction Motors in the powertrain of electric vehicles. (14)

Module IV

- 17 a) Explain the basic working principle of lithium-ion batteries with the relevant chemical reactions. What are the advantages of this technology over lead-acid batteries? (7)
- b) Explain the working principle of a Nickel-Metal Hydride battery with neat figures and relevant chemical reactions. Compare its performance parameters with Lead-acid batteries. (7)

OR

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

Module V

- 19 a) What are the typical objectives a fuzzy logic based energy management control strategy addresses, and what inputs are mainly employed in the strategy? (14)

OR

- 20 a) Classify and explain the basic principles of rule based energy management strategy with respect to hybrid electric vehicle. (14)
