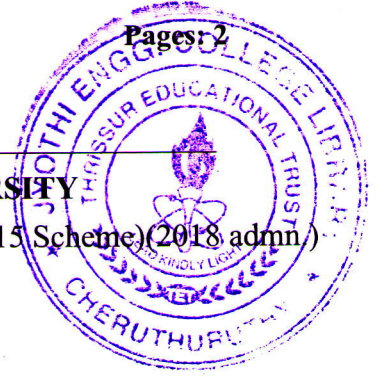


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree (Hons.) Examination December 2021 (2015 Scheme) (2018 admn)

**Course Code: EE469****Course Name: Electric and Hybrid Vehicles**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

- | | | |
|---|---|-----|
| 1 | Describe the developmental activities in the field of EVs/EHVs from 1890 to present day. | (5) |
| 2 | Explain the power flow control mode of a complex hybrid vehicle. | (5) |
| 3 | Explain the combined effect of armature voltage and field control of dc motor drive system with suitable graph. | (5) |
| 4 | What is meant by charge equalization of batteries? | (5) |
| 5 | Discuss the approximate sizing of battery for a new design of electric vehicle. | (5) |
| 6 | Describe the selection of power semiconductor device and its range of voltage and current for the converter in EVs. | (5) |
| 7 | Explain the major functions of control systems in EVs/HEVs. | (5) |
| 8 | Draw the typical architecture of electronic control unit for EVs/HEVs. | (5) |

PART B*Answer any two full questions, each carries 10 marks.*

- | | | |
|----|--|-----|
| 9 | a) Explain with block diagram the major components of hybrid electric vehicle. | (4) |
| | b) Explain the four resistive forces acting on the vehicle when it is moving and write the equations for those forces. | (6) |
| 10 | a) Discuss the significant impacts of modern power train (EVs/EHVs) on utility power supply system. | (6) |
| | b) What is meant by load power decomposition? Explain with suitable figures. | (4) |
| 11 | a) Discuss six alternatives of drivetrain configuration of electric vehicle with suitable figures. | (6) |
| | b) Explain with suitable block diagram, the complete fuel consumption process in IC engine vehicle. | (4) |

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Explain chopper-controlled dc motor (first quadrant-armature control) drive system with suitable figures and write the equations of output voltage and duty cycle. (5)
- b) Explain the working of single phase fully controlled rectifier fed armature-controlled dc drive system with suitable diagram. (5)
- 13 a) Draw and explain the block diagram representation of closed loop induction motor drive with constant volts/hertz control strategy. (7)
- b) Discuss the implementation of hysteresis controller for a DC motor chopper drive. (3)
- 14 a) Briefly explain different battery parameters. (6)
- b) What is meant by Peukert coefficient, derive the equation for calculating the Peukert coefficient. (4)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Explain peak torque, continuous rating, intermittent overload operation, and peak overload operation of electric motors used in electric vehicles. Also mark these parameters in the torque speed characteristics. (6)
- b) Discuss the two fundamental sizing constraints of electric motors in EVs/EHVs. (4)
- 16 a) Explain the available options of the energy storage technologies for EVs. (6)
- b) Explain the minor functions of control systems in EVs/HEVs (4)
- 17 a) Explain the use of control area network in electric vehicle. (6)
- b) Explain the fuzzy logic-based energy management control strategy used in EHVs. (4)
