

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

**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

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| 1 | Describe the present technological trends of EVs/EHVs and the challenges associated with it. | (5) |
| 2 | Describe the conceptual advantages of a hybrid electric vehicle over electric vehicles. | (5) |
| 3 | Write the classification of electric motors used for electric and hybrid electric vehicles. | (5) |
| 4 | What is meant by Peukert coefficient, derive the equation for calculating the Peukert coefficient. | (5) |
| 5 | 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. | (5) |
| 6 | Discuss the two fundamental sizing constraints of electrical motor in EV/EHV. | (5) |
| 7 | Explain the minor functions of control systems in EV/HEVs. | (5) |
| 8 | Explain the use of control area network in electric vehicles. | (5) |

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

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| 9 | a) Explain with block diagram, the major components of pure electric and pure gasoline vehicles. | (4) |
| | b) Explain with neat figure the translation of fuel energy into work at the wheels for a typical midsize vehicle in urban and highway driving. | (6) |
| 10 | a) What is meant by acceleration performance of vehicle and derive the corresponding equation. | (6) |

- b) Discuss the different considerations in the design of power control strategies for HEVs. (4)
- 11 a) Explain the different subsystems in electric vehicle with neat block diagram. (6)
- b) Explain with suitable block diagram the fuel efficiency of electric vehicle. (4)

PART C

Answer any two full questions, each carries 10 marks.

- 12 a) Discuss the electrical drive system for an electric vehicle with suitable block diagram. (5)
- b) Explain chopper-controlled dc motor (second quadrant-armature control) drive system with suitable figures and write the equations of output voltage and duty cycle. (5)
- 13 a) Explain the implementation of closed loop speed control of a two quadrant 3-phase converter-controlled (armature control) DC motor drive system with suitable block diagram. (7)
- b) Discuss the implementation of Pulse Width Modulation controller for a DC motor chopper drive. (3)
- 14 a) Explain the basic principle, advantages and disadvantages of fuel cell. (6)
- b) What is meant by charge equalization of batteries? (4)

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) Discuss the approximate sizing of battery for a new design of electric vehicle. (6)
- b) Describe the selection of power semiconductor device and its range of voltage and current for the converter in EVs. (4)
- 16 a) Explain the available options of the energy storage technologies for EVs. (6)
- b) Explain the fuzzy logic-based energy management control strategy used in EHV's. (4)
- 17 a) Discuss the typical architecture of electronic control unit for EVs/HEVs. (6)
- b) Explain the major functions of control systems in EVs/HEVs. (4)
