Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**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 | Explain the vehicle power source and transmission characteristics. | (5) |
| 2 | Give the different classification of electric vehicles based on drive train configurations. | (5) |
| 3 | What are the desired features of electric motor used in electric vehicles? | (5) |
| 4 | Define the terms specific power and energy density associated with energy storage systems of electric vehicles. | (5) |
| 5 | What are the factors on which the sizing of electric motors for electric vehicle depends? | (5) |
| 6 | What are the points to be considered for selecting the energy storage technology for hybrid electric vehicle? | (5) |
| 7 | What are the supporting sub systems of hybrid electric vehicles? | (5) |
| 8 | Enlist different rule-based strategies for the energy management in hybrid vehicle. | (5) |

## PART B

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

| | | | |
|---|---|---|---|
| 9 | a) | Compare the performance of ICE vehicles with hybrid electric vehicles. | (5) |
| | b) | Give the different classification of electric vehicles based on power source configurations. | (5) |
| 10 | a) | How the hybrid vehicles are classified based on the general definitions? | (5) |
| | b) | Explain the dynamic modelling of a four-wheeler vehicle with necessary assumption. | (5) |
| 11 | a) | Explain the general electric vehicle configuration with the help of block diagram. | (10) |

## PART C

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

12 a) With the help of neat diagrams explain the four-quadrant chopper-based speed control of DC motors. (6)

b) Explain the working of fuel cell and also state its limitation. (4)

13 a) Draw and explain the ideal torque speed characteristics of electric drive for electric vehicles. (3)

b) How is it possible to use fly wheel as an energy storage device for electric vehicle? (4)

c) Give the advantages and disadvantages of super capacitors as an energy storage device in electric vehicle. (3)

14 a) Explain the v/f speed control of induction motors used in electric vehicle. (6)

b) What superior characteristics of super capacitors make it more suitable for electric vehicle applications? (4)

## PART D

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

15 With the help of neat figure explain the epicyclic gear transmission system used in electric vehicle. (10)

16 a) State and explain the optimal control problem associated with hybrid vehicle. (4)

b) With the help of block diagram explain the hierarchical power and data transmission networks of hybrid vehicles**.** (6)

17 a) With the help of block diagram explain the battery management supporting system of hybrid vehicle. (5)

b) Enlist the factors which govern the sizing of power electronics for EHVs. (5)

****