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

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.

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)	Discus 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 EHVs.	(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)

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