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Reg No.:___

Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh semester B.Tech examinations (S), September 2020

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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Compare	the	performance	of	ICE	based	conventional	vehicle	and	electric	(5)
vehicles.										

- 2 What is meant by "gradeability" of vehicles? Explain with mathematical (5) expression.
- 3 How the electric motors used in EVs differs from that of used in industrial (5) application?
- 4 What is Peukart's capacity of battery? What are the significance applications? (5) Calculate the Peukart's capacity of a 135Ahr battery with C10 (10Ahr) rating. (Peukart's coefficient is 1.2)
- 5 Explain briefly the electrical and mechanical constraints to be considered while (5) sizing an electrical machine for an EV.
- What are the steps in designing power electronics for hybrid Electric vehicle? 6 (5)
- 7 What are the supporting subsystems in an electric/hybrid vehicle? (5)
- 8 What are the advantages of fuzzy logic-based energy management control (5) strategy in hybrid vehicles?

PART B

Answer any two full questions, each carries 10 marks.

- 9 a) What are the resistive forces acting on a four-wheel vehicle? (6)
 - Explain briefly the performance parameters of vehicle. b) (4)
- 10 Draw and explain ideal traction power plant characteristics of various power (10)plants and various power source characteristics used in electric and hybrid electric vehicles.
- 11 Draw and explain architecture and power flow control of series parallel hybrid (10)electric vehicle.

PART C

Answer any two full questions, each carries 10 marks.

A 96 V battery pack is connected to a series RL load with L=150mH .The 12 a) (5) battery pack has a battery capacity of 150Ahr. At t = 0 the switch is closed and the battery begins to discharge. Calculate the battery discharge current, if the steady state discharge rate is C/2. Neglect battery voltage drop.

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- b) Compare different batteries based on their specific energy, specific power and (5) suitability for EV/HEV applications.
- 13 a) Discuss the possible power converter topologies that can be used in induction (6) motor drive for EV/HEV.
 - b) Explain the operation, advantage and disadvantages of fly wheel energy (4) storage.
- 14 Explain the four-quadrant operation of speed control of DC motor driven (10) electric vehicle.

PART D

Answer any two full questions, each carries 10 marks.

(10)

- 15 a) Draw and explain typical CAN system of an HEV.
- 16 a) Classify and explain the basic principles of rule-based energy management (10) system.
- 17 a) Explain the sizing procedures of energy storage systems for electric hybrid (5) vehicle.
 - b) Draw the typical torque speed envelope curves of drive train motors and how (5) the continuous, intermittent and peak overload ratings.
