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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - AUGUST 2023

Regulation: UG-20

ELECTRICAL AND HYBRID VEHICLES

Time: 3 Hours (ELECTRICAL AND ELECTRONICS ENGINEERING) Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

- (a) Briefly discuss about the social and environmental importance of hybrid and electric vehicles.
[BL: Understand| CO: 1|Marks: 7]
- (b) What type of transmission system is used in electric vehicle? Draw a general lay out of a Electric Vehicle (EV) and discuss the transmission characteristics. [BL: Understand| CO: 1|Marks: 7]

MODULE – II

- (a) Describe the basic concept of hybrid traction and various hybrid drive-train topologies.
[BL: Understand| CO: 2|Marks: 7]
- (b) Develop the power flow control in electric drive-train topologies with neat architecture. Also examine the fuel efficiency analysis. [BL: Understand| CO: 2|Marks: 7]

MODULE – III

- (a) List the types of electric motors used in hybrid and electric vehicles. How the electric motors used in EVs differs from that of used in industrial application?
[BL: Understand| CO: 3|Marks: 7]
- (b) Examine the configuration and control of permanent magnet motor drives with necessary sketch.
[BL: Understand| CO: 3|Marks: 7]
- (a) Develop the four-quadrant operation of speed control of DC motor driven electric vehicle with suitable waveforms. [BL: Understand| CO: 4|Marks: 7]
- (b) Outline the configuration and control of switch reluctance motor drives with necessary sketch.
[BL: Understand| CO: 4|Marks: 7]

MODULE – IV

- (a) Obtain the basic principle of super capacitors based energy storage system in hybrid and electric vehicles. [BL: Understand| CO: 5|Marks: 7]
- (b) Write the need for energy storage requirements in hybrid and electric vehicles. Differentiate between ultra-capacitor and battery as an energy storage device for EV in detail.
[BL: Understand| CO: 5|Marks: 7]

6. (a) Classify the various energy storage devices used in hybrid and electric vehicles. Elaborate the fuel cell based energy storage and its analysis. [BL: Understand| CO: 5|Marks: 7]
(b) Illustrate the flywheel based energy storage and its analysis with suitable sketch. [BL: Understand| CO: 5|Marks: 7]

MODULE – V

7. (a) Classify different energy management strategies applied to electric vehicles and hybrid vehicles. [BL: Understand| CO: 6|Marks: 7]
(b) Compare rule based and fuzzy energy management strategies. Explain the battery management system in a hybrid electric vehicle. [BL: Understand| CO: 6|Marks: 7]
8. (a) Demonstrate the various communication protocols and technologies used in vehicle networks. [BL: Understand| CO: 6|Marks: 7]
(b) How to choose the proper energy storage systems for vehicle applications? Elaborate in detail. [BL: Understand| CO: 6|Marks: 7]

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