CBCS SCHEME

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21EE734

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Electric Vehicle Technologies

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define a series hybrid electric vehicle and explain it configuration with neat diagram in corporating various nodes of operation. **(10 Marks)**

b. Draw and explain various possible EV configurations based on the variations in electric propulsion characteristics and energy sources. **(10 Marks)**

OR

2 a. Explain the configuration of modern electric vehicle drive train with a neat functional diagram. **(10 Marks)**

b. With neat diagram explain hybrid electric vehicles working principle in detail. **(10 Marks)**

Module-2

3 a. List out and explain in detail various requirements of energy storage devices used in EV application. **(10 Marks)**

b. Define and explain the following battery parameters
   i) Specific energy
   ii) Energy stored
   iii) Charge capacity
   iv) Battery capacity
   v) Depth of charge **(10 Marks)**

OR

4 a. Explain the following Fuel cells :
   i) PEMFC ii) DMFC iii) SOFC iv) PAFC **(12 Marks)**

b. Explain the principle of operation of a double layer ultra capacitor with a neat diagram. **(08 Marks)**

Module-3

5 a. Explain the operation of following DC drives with a neat circuit diagram and steady state wave form.
   i) Step down chopper drive
   ii) Step up chopper drive **(10 Marks)**

b. Explain the separation of half bridge converter used in switched reluctances motor drives with the help of a circuit diagram. **(10 Marks)**

OR

6 a. Explain the following control schemes of a BLDC motor drives with a relevant block diagram.
   i) Torque control scheme
   ii) Speed control scheme **(10 Marks)**

b. Explain field orientation control of induction motor for varying its torque speed characteristics with relevant curves. **(10 Marks)**

Module-4

7 a. With neat block diagram of control scheme of the parallel hybrid drive train, explain its control strategies. **(10 Marks)**

b. Explain several operating patterns of drive train. **(10 Marks)**

OR

8 a. With neat block diagram, explain the configuration of the parallel torque coupling hybrid drive train. **(10 Marks)**

b. Explain design of drive train parameters with necessary equation and curves. **(10 Marks)**

Module-5

9 a. List out and explain in detail various charging methods of battery used in Ev and HEv. **(10 Marks)**

b. Explain high frequency transformer based two stage insulated charger topology for batteries used in Ev and HEv with neat circuit diagram. **(10 Marks)**

OR

10 a. Explain the following tranformerless charger topology for battery with a neat circuit diagram.

i) Simple buck topology

ii) Neutral – point clamped topology **(10 Marks)**

b. Explain in detail about the design of z-circuit capacitor and inductor with relevant equations. **(10 Marks)**

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