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18AU754

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022 Introduction to Electric Vehicles

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What are the major differences in an electric vehicle and the conventional IC engine vehicles you normally use in your household? Mention. (04 Marks)
- b. Explain briefly the need of an electric drive. (08 Marks)
- c. Discuss on the historical development of Electric vehicles. (08 Marks)

OR

- 2 a. Make a comprehensive discussion on the concept of EV's and key technologies. (10 Marks)
- b. What the major issues with electric vehicles? Discuss. (10 Marks)

Module-2

- 3 a. Explain the following components of an Electric Vehicle circuits and mention their functions:
 - i) Conductors
 - ii) Insulators
 - iii) Solenoids
 - iv) Capacitors. (10 Marks)
- b. What are the weight and size parameters under consideration while designing the electric vehicles? Mention and discuss. (10 Marks)

OR

- 4 a. Differentiate between AC and DC motors. With suitable sketch, explain the working principle of DC motor. (10 Marks)
- b. List out different EV parameters and explain the following :
 - i) Force parameters
 - ii) Energy parameters. (10 Marks)

Module-3

- 5 a. Write down the major merits and demerits of Battery Operated Electric Vehicle (BOEV). (08 Marks)
- b. Using suitable block diagram, explain the major components of a BOEV. (12 Marks)

OR

- 6 a. A two wheeler uses 25Wh/km. A battery is to be designed with 80km range. Assuming full capacity is available, find the size of the battery required in kWh. (08 Marks)
- b. What is the function of a flywheel? Explain how energy is stored using a flywheel. (12 Marks)

Module-4

- 7 a. Sketch and explain the following types of batteries, focussing on working principle
i) Lead Acid Battery
ii) Nickel metal hydride battery. (10 Marks)
- b. Define the following battery parameters
i) Battery capacity
ii) Discharge rate
iii) State of charge (SOC)
iv) State of discharge
v) Depth of discharge (10 Marks)

OR

- 8 a. Briefly discuss on the following methods of battery rating.
i) Ampere – Hour (AH)
ii) Watt – Hour (WH)
iii) Cold Cranking Amps (CCA) (10 Marks)
- b. A 34 kWh battery i) is charged at SoC or State of Charge of 64%, what energy it contains?
ii) Has a voltage of 350V, what is its capacity in Ah? iii) What is its Watt – hour rating? (10 Marks)

Module-5

- 9 a. With a neat sketch of the basic structure of a fuel cell explain its working, clearly stating the chemical reactions. (10 Marks)
- b. Write a brief account of fuel cell characteristics. (10 Marks)

OR

- 10 a. Sketch and explain a solid oxide fuel cell. (10 Marks)
- b. Explain hydrogen storage systems and reformers. Describe how a methanol steam reformer works. (10 Marks)
