

CBCS SCHEME

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18AU754

Seventh Semester B.E. Degree Examination, June/July 2024 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. Briefly explain the present and future development in electric vehicles. (10 Marks)
b. Make a brief discussion on 'Historical development' of electric vehicles. (10 Marks)

OR

- 2 a. Explain the need for an electric drive. Further discuss briefly on EV concept and key technologies. (10 Marks)
b. With suitable sketch, outline a battery operated electric vehicle and explain the components. (10 Marks)

Module-2

- 3 a. Sketch and explain the working of a Brushless DC motor, showing the action of various duty cycles. (10 Marks)
b. With appropriate sketch/circuit diagram describe the following :
i) Relays ii) capacitors. (10 Marks)

OR

- 4 a. With a schematic sketch explain the following components of 'Traction Force' :
i) Acceleration force
ii) Aerodynamic drag
iii) Rolling resistance
iv) Climbing force. (10 Marks)
b. An EV battery has a capacity of 15kWh. Assuming 0.9DoD and 75% end of life (EOL) what is the range that the vehicle (using 80wh/km) can support when the battery is new. What range will it support at the end of life? Assume auxiliary power used is 500W continuously and the efficiency of motor and controller is 85% each, and average vehicle speed is 40km/ph. (10 Marks)

Module-3

- 5 a. With suitable sketch, outline a hybrid electric vehicle and explain all its major components. (10 Marks)
b. Using a schematic sketch explain the concept of 'Regenerative braking'. (10 Marks)

OR

- 6 a. Compare a battery operated electric vehicle with an IC engine vehicle. (07 Marks)
b. What are the basic diagnosis and precautions required for efficient working of an EV? (07 Marks)
c. Write short notes on flywheel energy storage. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Discuss briefly about batter ratings and parameters, namely :
 i) SoC ii) DoD iii) SoH iv) Usable capacity. (10 Marks)
- b. A 34kwh battery is charged at SoC of 64%. Determine its energy content in kwh and its capacity Ah, if the battery voltage is 350V. (05 Marks)
- c. Assuming SoC is linear function of voltage find :
 i) SoC at 4V
 ii) voltage at SoC of 64%
- Assume, $\text{SoC} = \left(\frac{100\text{V} - 270}{1.6} \right)$. (05 Marks)

OR

- 8 a. Sketch and explain the working of Nickel metal hydride batter cell. (10 Marks)
- b. Discuss with a schematic diagram, working of a lead acid battery. (10 Marks)

Module-5

- 9 a. Draw a layout of fuel cell electric vehicle and discuss on the major components. (10 Marks)
- b. Explain with a schematic diagram, the working principle of a proton exchange membrane fuel cell. (10 Marks)

OR

- 10 a. Discuss briefly on hydrogen storage systems. (10 Marks)
- b. Write a brief note on the following :
 i) Hydrogen fuel cell
 ii) Molten carbonate fuel cell. (10 Marks)
