



CBCS SCHEME

18EE752

Seventh Semester B.E. Degree Examination, June/July 2024 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 Electric Vehicles? List the features of Electric Vehicles along with top level perspective diagram. (10 Marks)
b. With the equation, explain constant and non-constant F_{TR} on level road. (10 Marks)

OR

- 2 a. Describe the laws of motion and also mention power for i_{th} torque. (10 Marks)
b. Explain the dynamics of vehicle motion. (10 Marks)

Module-2

- 3 a. Define a hybrid electric vehicle and explain its advantages and disadvantages. (06 Marks)
b. Define and draw the block diagram of a series hybrid electric vehicle. (07 Marks)
c. Define and draw the block diagram of a parallel hybrid electric vehicle. (07 Marks)

OR

- 4 a. What are the requirements that define the drive train architecture of hybrid vehicles? (07 Marks)
b. Explain the apportioning of power between the heat engine and the electric motor in a hybrid electric vehicle. (07 Marks)
c. Draw and explain a series-parallel combination hybrid electric vehicle. (06 Marks)

Module-3

- 5 a. Explain the construction of a lead acid battery. (10 Marks)
b. Explain the reaction in each electrode during charging and discharging of a lead acid battery. (10 Marks)

OR

- 6 a. Discuss the compounds used in a lithium ion battery. (10 Marks)
b. Explain the reactions in a lithium-ion battery during charging and discharging. (10 Marks)

Module-4

- 7 a. Explain various types of motors that can be used in an electric vehicle. (06 Marks)
b. Explain V/f control of induction motor for electric vehicle. (07 Marks)
c. Explain vector control of an induction motor. (07 Marks)

OR

- 8 a. Explain abc to $\alpha\beta$ conversion in the context of AC drives for electric vehicles. (10 Marks)
b. Explain the use of synchronous motors in electric vehicles. (10 Marks)

Module-5

- 9 a. Explain in detail the general torque-speed envelope of an electric motor drive and its various zones of operation. (07 Marks)
- b. Explain when the need for gears arises and what is a differential gear. (07 Marks)
- c. Define maximum gradability of an electric vehicle if the maximum tractive force is F_{tr} and the weight of the vehicle is "M". (06 Marks)

OR

- 10 a. What is the six-step operation mode of a three-phase bridge inverter for an electric vehicle? (07 Marks)
- b. Explain sinusoidal pulse with modulation of a three-phase bridge inverter for an electric vehicle. (07 Marks)
- c. Explain the transmission system requirement of an electric vehicle. (06 Marks)
