CBCS SCHEME

USN

21EE734

# Seventh Semester B.E. Degree Examination, Dec.2025/Jan.2026

# Electric Vehicle Technologies

Time: 3 hrs. Max. Marks: 100

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

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-1

1 a. Draw and explain various possible EV configurations based on variations in electric propulsion characteristics and Energy Sources. **(10 Marks)**

b. Define a parallel hybrid drive – train and explain its configuration with neat diagram. **(10 Marks)**

**OR**

2 a. Define a Series hybrid electric vehicle and explain its configuration with a neat diagram incorporating various modes of operation. **(10 Marks)**

b. Explain the following :
   i) Traction motor characteristics
   ii) Tractive effort and transmission requirement. **(10 Marks)**

## Module-2

3 a. Explain with neat diagram , the components of battery cell and explain cell discharge and charge operations. **(10 Marks)**

b. List the types of batteries and with neat diagram, explain the operation of a Li – Ion Battery. **(10 Marks)**

**OR**

4 a. Briefly explain following battery parameters : i) Battery capacity ii) Discharge rate iii) State of charge iv) State of discharge v) Depth of discharge. **(10 Marks)**

b. Discuss briefly the importance , advantages and application of super capacitor. **(10 Marks)**

## Module-3

5 a. Explain in detail functional block diagram of a typical electric propulsion system. **(10 Marks)**

b. Explain the operation of following DC drives with a neat circuit diagram and steady state waveform : i) Step – down Chopper drive (Class A)
   ii) Step – up Chopper drive (Class B). **(10 Marks)**

**OR**

6 a. Explain the constant V/f control of induction motor for varying its torque – speed characteristics with relevant curves. Also depict the power electronic control for V/f control with the help of block diagram. **(10 Marks)**

b. With a neat diagram, explain the Speed control of the BLDC motor. **(10 Marks)**

## Module-4

7 a. With the block diagram, explain over all Control Scheme of the parallel hybrid drive train. **(10 Marks)**

b. Explain in detail power rating of electric motor drive in Series HEV speed torque characteristics. **(10 Marks)**

OR

8 a. Discuss in detail the considerations in design of electric motor drive capacity. (10 Marks)

b. Explain the energy storage design in EVs. (10 Marks)

## Module-5

9 a. Define the term battery charging and termination. List different methods of battery charging. Explain any two among them. (10 Marks)

b. Explain with a neat diagram – isolated bidirectional DC – DC converter. (10 Marks)

OR

10 a. Explain importance of power electronics converters for battery charging. (10 Marks)

b. Discuss briefly 2 – source converter for EV and HEV. (10 Marks)

* * * * *