

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023

(2020 SCHEME)

Course Code : 20EET443

Course Name: Electric Vehicles

Max. Marks : 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain any three reasons that led to the evolution of electric vehicles.
2. Illustrate ideal performance characteristics for a vehicle power plant.
3. Draw the typical electric vehicle configuration.
4. Describe the parallel configuration of hybrid drive train.
5. Summarize the main components of electric traction system.
6. Explain the operation of a DC drive in regenerative braking mode.
7. Comment on the suitability of lead acid battery in hybrid electric vehicles.
8. Explain the significance of deep cycles and depth of discharge of batteries associated with in EV.
9. Compare different energy management strategies used in EV/HEV.
10. Interpret the optimization-based strategy used in EHV's.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Derive the dynamic equation for vehicle motion. (9)
b) Discuss the environmental importance of hybrid electric vehicles. (5)

OR

12. a) Explain the resistive forces acting on a vehicle and derive the expression for total driving resistance. (9)
b) Compare the transmission characteristics of the internal combustion engine and the electric motor. (5)

MODULE II

13. Discuss the various drive train configurations in EV. (14)

OR

14. Explain the power flow control in series – parallel hybrid systems in HEVs. (14)

MODULE III

15. a) Describe how DC separately excited motor is operated in four quadrants. (10)
b) Compare the electric motors used in EVs and that in industrial applications? List the three motors commonly employed in electric vehicles. (4)

OR

16. a) Demonstrate the Field Oriented Control of Induction Motors in the electric vehicles. (7)
b) Explain the v/f control of induction motor with a block diagram. (7)

MODULE IV

17. a) Explain the role of super capacitors and flywheels in electric vehicles. (7)
b) Explain the working of fuel cell. List its advantages and disadvantages. (7)

OR

18. a) What are the requirements of energy storage system employed in electric vehicles? (4)
b) Explain the operation of Lithium ion batteries with necessary diagram. Write the chemical reactions involved in it. (10)

MODULE V

19. a) Describe the significance of a communication network in electric vehicles? Illustrate CAN bus communication in electric vehicles. (7)
b) Explain the energy management strategies in EVs. (7)

OR

20. a) Explain the fuzzy logic-based energy management control strategy used in EHV's. (7)
b) Discuss battery management system in EVs. (7)
