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**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023****MECHANICAL ENGINEERING****(2020 SCHEME)****Course Code : 20MET451****Course Name: Hybrid and Electric Vehicles****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. What are the environmental importance of hybrid vehicles?
2. Draw the layout of a hybrid vehicle and label the primary parts
3. Why induction motor is known as asynchronous motors?
4. Which type of motor is used in heavy electric vehicles? Substantiate your answer
5. Which is the most common control algorithm used in automation?
6. Draw the symbol of MOSFET and label its terminals
7. What are the factors to be considered while using battery bus bars?
8. List any 3 battery sensors used in EVs and quote their function.
9. What are the functions of ECU?
10. Which type of frame is used for racing cars. Why?

**PART B*****(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) With suitable block diagrams, explain the different configurations of hybrid vehicle. (8)
- b) Why we pay careful attention to details such as recessing the door handles and streamlining outside mirrors while designing an automobile? (6)

**OR**

12. a) Explain the factors that influence the vehicle dynamics. (8)
- b) What are the challenges that restrict EV boom in the current scenario? (6)

**MODULE II**

13. Explain the constructional details of an induction motor with diagram (14)

**OR**

14. Explain sensor-based speed control system used in hybrid vehicles. (14)

**MODULE III**

15. a) Explain the role of motor controller in the performance of electric vehicles. (7)

b) What are the main differences between MOSFET and IGBTs. (7)

**OR**

16. a) Explain different types of gear trains used in HEVs. (7)

b) Discuss the importance of gear optimization in HEVs. (7)

**MODULE IV**

17. Which are the common charging protocols? Explain. (14)

**OR**

18. What are the factors to be considered in battery pack design? (14)

**MODULE V**

19. Explain the 6 levels of EV validation. (14)

**OR**

20. How chassis designing of an HEV differ from that of an IC engine vehicle? (14)

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