Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20963

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fifth Semester

Electrical and Electronics Engineering

EE 3028 — DESIGN OF ELECTRIC VEHICLE CHARGING SYSTEM

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Bi-Directional Charging?

2. What is Wireless Charging?

3. Give the significance of power electronic converters for EV battery charging.

4. Define Power Density with its unit.

5. Compare converter and inverter based on their functions.

6. Give the Topology of AC Level 1 Charger.

7. What is magnetic resonance?

8. Is it possible charge electric vehicles while in motion? Yes or no substantiate it.

9. State the need for power factor correction, in charging system.

10. What do mean by current ripple.

PART B — (5 × 13 = 65 marks)

11. (a) (i) What does Electric Vehicle (EV) charging infrastructure refer to? List and explain key Components of EV charging infrastructure. (8)

(ii) Write notes on the need and benefits of inductive charging for EVs. (5)

Or

(b) (i) Explain the following terms related to Bidirectional Charging

(1) Grid Stabilization

(2) Load Shifting

(3) Standardization

(4) Renewable Energy Integration. (8)

(ii) Write notes on vehicle-to-grid (V2G) systems (5)

12. (a) Explain with neat sketch the working of AC-DC converter with a boost Power Factor Correction (PFC) circuit for EV Battery charging. Also, discuss the benefits of using a boost PFC circuit. (13)

Or

(b) Explain with neat sketch the components and working of Half-bridge bidirectional converter for EV Battery charging. Also, Discuss the advantages and disadvantages of it. (13)

13. (a) Explain how the Integration an electric vehicle (EV) charging system with a home solar photovoltaic (PV) system can be achieved. Also discuss about the factors to be considered while developing such system. (13)

Or

(b) (i) Write about following operation modes of EVC-HSP system.

(1) Hybrid Mode

(2) Load Shifting Mode (6)

(ii) Write notes on Control strategy of EVC-HSP system (7)

14. (a) (i) Compare the principle of operation of electromagnetic resonance and Inductive Coupling for wireless power transfer. (6)

(ii) Explain the construction working of a Nickel-Metal Hydride (NiMH) battery. Also discuss about its advantages and disadvantages. (7)

Or

(b) (i) List and explain different types of Wireless Power Transfer. (6)

(ii) Explain the construction working of a Lithium-Ion (Li-Ion) battery. Also discuss about its advantages and disadvantages. (7)

15. (a) Discuss about power losses in a rectifier based charging system. Also discuss about how to determine these losses. (13)

Or

(b) Elaborate the steps involved in deciding the size of the boost inductor for power factor correction. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Discuss about issues and challenges involved in high power static and dynamic wireless charging. (15)

Or

(b) Give an overview about the international standards and regulations of charging stations. (15)

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