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Question Paper Code: U3409

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Professional Elective

Electrical and Electronics Engineering

21EEV409 - ELECTRIC VEHICLE CHARGING SYSTEMS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Explain constant voltage charging in EVs? Give an example. CO1- U
2. Explain the Working of pulse charging and State one advantage. CO1- U
3. Differentiate between AC and DC chargers used in electric vehicles CO1- U
4. Summarize how onboard charger in an EV differ from a charging station charge CO1- U
5. Explain the concept of wireless power transfer in electric vehicle charging. CO1- U
6. Explain the concept of battery swapping in electric vehicles. CO1- U
7. Explain the Role of standards like CHAdeMO, SAE, and IEC in electric vehicle charging infrastructure. CO1- U
8. Explain how the A4WP standard differs from the Qi standard in terms of charging capabilities. CO1- U
9. Function of load management in electric vehicle charging stations? CO1- U
10. Explain the concept of Vehicle-to-Grid (V2G) technology. CO1- U

PART – B (5 x 16= 80 Marks)

11. (a) How does pulse charging differ from Constant Voltage and Constant Current methods? Explain in Detail. CO1-U (16)
Or
(b) Explain the different types of electric vehicle charging methods, including constant voltage, constant current, and pulse charging. CO1-U (16)
Discuss their advantages and applications.

12. (a) Imagine you need to troubleshoot an issue where an EV is charging slowly with a Level 2 AC charger. How would you investigate the potential problems in the charging circuit? CO2- App (16)
- Or
- (b) If you are tasked with designing an AC charger for an electric vehicle, how would you configure the charging circuit to convert AC to DC? CO2- App (16)
13. (a) Analyze the trade-offs between resonant inductive coupling and non-resonant inductive coupling in wireless power transfer systems for EV charging. Which system would be more suitable for dynamic charging applications, and why? CO3-Ana (16)
- Or
- (b) Analyze the impact of electromagnetic interference (EMI) on the performance and safety of wireless power transfer (WPT) systems. What strategies can be implemented to reduce EMI in these systems, and how do they affect the overall system design and cost? CO3-Ana (16)
14. (a) If you were an EV manufacturer, how would you decide whether to use the CHAdeMO or CCS standard for your vehicle? CO2- App (16)
- Or
- (b) Develop proposal for standardized EV charging infrastructure integrating multiple standards. Consider scalability, interoperability, and ease of deployment. CO2- App (16)
15. (a) Analyze the potential of vehicle-to-grid (V2G) technology in supporting grid stability. How can EVs serve as distributed energy resources, and what challenges need to be addressed for widespread V2G adoption? CO3- Ana (16)
- Or
- (b) Analyze the advantages and disadvantages of using a pantograph charging system for large electric vehicles, such as buses. Discuss the challenges in infrastructure deployment and its applicability to various types of EVs. CO3- Ana (16)