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Question Paper Code:U3203S

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Professional Elective

21EEV404 – DESIGN OF ELECTRIC VEHICLE CHARGING SYSTEM

(Common to EEE & Mechanical Engineering)

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

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| 1. Mention the Indian standards for EV Charging. | CO1- U |
| 2. What are the various Charging technologies? | CO1- U |
| 3. Mention the various power electronic converters used for EV Charging. | CO1- U |
| 4. Differentiate AC and DC Charging System. | CO1- U |
| 5. What are the various EV charging topologies? | CO1- U |
| 6. What are the various operation modes of EVC-HSP system? | CO1- U |
| 7. What is magnetic resonance? | CO1- U |
| 8. Differentiate between inductive and capacitive Charging. | CO1- U |
| 9. How Boost Converter is used for Power Factor Correction? | CO1- U |
| 10. What is the need for power factor correction? | CO1- U |

PART – B (5 x 16= 80 Marks)

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|---|----------|------|
| 11. (a) Discuss the international standards and regulations for EV charging systems (SAE, IEC, IEEE, ISO). | CO1- U | (16) |
| Or | | |
| (b) Explain the need for bidirectional power flow in EV charging and its applications in V2G systems. | CO1- U | (16) |
| 12. (a) Differentiate between bridge rectifier with PFC and bridgeless PFC circuits used in EV charging systems. Which one provides higher efficiency? Justify with analysis. | CO2- Ana | (16) |

Or

- (b) Explain and analyze the power flow characteristics of a bidirectional DC–DC converter in charging (G2V) and discharging (V2G) modes. CO2- Ana (16)
13. (a) Justify the most effective operation mode of EVCHSP systems under variable solar generation and household demand conditions. CO3- App (16)
- Or
- (b) Determine the performance benefits and limitations of an EV–Home Solar PV integrated system (EVCHSP) in terms of efficiency and cost. CO3- App (16)
14. (a) Summarize the different types of electric vehicles (BEV, PHEV, HEV, FCEV) and explain which types benefit most from wireless charging. CO4- U (16)
- Or
- (b) Discuss the different wireless chargers for EVs (stationary and dynamic) and their practical applications. CO4- U (16)
15. (a) An EV charger of 5 kW is connected to a 230 V, 50 Hz supply. Design the PFC circuit using a boost converter and calculate the average rectifier currents. CO5- App (16)
- Or
- (b) Design the PFC boost converter for an EV charger delivering 1.5 kW at 400 V DC output from a 110 V AC supply. Calculate the required inductor size and duty ratio. CO5- App (16)