

A

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code: U3405S**

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

Professional Elective

Electrical and Electronics Engineering

21EEV405 – TESTING OF ELECTRIC VEHICLES

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Summarize the current status of global EV standardization.. CO1- U  
(a) Complete (b) Not yet started (c) In development (d) Same as fuel-based
2. Interpret the goal of international standard bodies in EV domain. CO1- U  
(a) Enforce taxes (b) Prevent EV growth  
(c) Facilitate safe and interoperable ev (d) Promote fuel vehicles
3. Outline the function of an AC dynamometer in EV testing CO1-U  
(a) Measures paint finish (b) Records noise lvl  
(c) Simulates varying (d) Tests lights
4. Summarize the role of software development in functional safety CO1-U  
(a) Adds user interface only (b) Enables speed boost  
(c) Ensures the system logic follows safety (d) Protects from rain
5. Demonstrate how fault tree analysis aids safety in EVs CO1-U  
(a) Builds new circuits  
(b) Analyzes potential faults leading to system failure  
(c) Optimizes audio system  
(d) Enhances visual design
6. Summarize the role of software development in functional safety. CO1-U  
(a) Adds user interface only (b) Enables speed boost  
(c) Ensures the system logic follows protocol (d) Protects from rain

7. In a DC-DC converter system, which factor most contributes to conducted EMI? CO1- U
- (a) Use of passive filters (b) Input/output cable length  
(c) Magnetic field shielding (d) Electromagnetic absorbers
8. Wireless charging systems in EVs cause EMC issues mainly due to CO1- U
- (a) Low-frequency (b) High-power acoustinoise  
(c) Strong alternating (d) DC ripple
9. Which component represents the EMI coupling path in motor drives? CO1- U
- (a) Transmission belt (b) Power cables and grounding system  
(c) Tire tread (d) Cooling water flow
10. Which type of EMI is typically observed in DC-DC converters? CO1- U
- (a) Low-frequency mechanical noise (b) High-frequency conducted emissions  
(c) Visible light interference (d) Acoustic vibration

PART – B (5 x 2= 10 Marks)

11. Interpret the current global status of EV standardization. CO1- U
12. Compare the test procedures using M-G set and AC dynamometer. CO2 - U
13. Summarize the process of hazard and risk assessment in EV systems. CO3 - U
14. Illustrate how cable length influences conducted emissions in DC-DC converters. CO4 - U
15. Interpret the significance of conducted emission tests in motor drives. CO5 - U

PART – C (5 x 16= 80 Marks)

16. (a) Classify the different international bodies and consortia involved in the development of EV standards, and describe their roles, objectives, and interdependencies in the global ecosystem. CO3- Ana (16)
- Or
- (b) Demonstrate how national and international standards can be implemented when integrating third-party battery modules into a locally manufactured EV. CO3- Ana (16)
17. (a) Implement a type test on an AC induction motor drive, and document how the motor's thermal response and dynamic performance are evaluated. CO3- Ana (16)

Or

- (b) Develop a test protocol to validate controller switching logic under various torque demands for an EV with regenerative braking. CO3- Ana (16)
18. (a) Analyze the key differences between functional safety and general product quality in electric vehicles, and discuss why both are required for high-reliability systems. CO3 -Ana (16)
- Or
- (b) Examine how the reliability of an electric vehicle system is enhanced through redundancy and the use of reliability block diagrams (RBD), citing specific subsystem examples. CO3- Ana (16)
19. (a) Develop a comprehensive filtering and shielding strategy for the power electronics in an electric vehicle with the aim of ensuring compliance with EMC standards. Your plan should include solutions for motor drives, DC-DC converters, and charging systems, and you must justify how each proposed design element addresses both radiated and conducted interference. CO2- App (16)
- Or
- (b) Implement a detailed test plan for measuring conducted emissions from a wireless charging system in an electric vehicle. Describe the measurement setup, instruments to be used, and the applicable frequency range, and explain how the test results will guide the improvement of EMC performance in the charging system. CO2- App (16)
20. (a) Demonstrate with examples how IGBT switching characteristics contribute to EMI generation in motor drive systems, and show how these effects can be measured during experimental testing. CO2- App (16)
- Or
- (b) Illustrate the process of developing a high-frequency equivalent circuit model for a DC-DC converter, and explain how this model can be applied to predict and analyze EMI behavior. CO2- App (16)

