Total No. of Questions: 21

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

AU3EL31 EV Standards, Safety, Testing & Certification

Programme	:	B.Tech.	**Branch/Specialisation**	:	AU
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Marks CO BL

Q1. Which standard defines functional safety requirements for electrical and electronic systems in road vehicles? **1 1 1**

- ○ ISO 9001
- ○ ISO 14001
- ◉ ISO 26262
- ○ ISO 50001

Q2. What is the primary purpose of CMVR (Central Motor Vehicle Rules) type approval for electric vehicles in India? **1 1 1**

- ○ To regulate fuel efficiency
- ◉ To ensure compliance with safety and performance standards before road use
- ○ To control battery manufacturing costs
- ○ To determine insurance policies for EVs

Q3. What is the standard voltage level for an Electric Vehicle Conductive AC Charging System (as per international charging standards)? **1 2 1**

- ○ 12V
- ○ 48V
- ◉ 230V - 400V
- ○ 1000V

Q4. Which of the following is a key advantage of Electric Vehicle Conductive DC Charging Systems over AC Charging Systems? **1 2 1**

- ○ Lower cost of infrastructure
- ◉ Faster charging times due to direct power transfer to the battery
- ○ Compatibility with all vehicle types
- ○ Lower power consumption

Q5. CMVR type approval for retro fitment of hybrid electric systems applies to which categories of vehicles? **1 3 1**

- ○ Only two-wheelers
- ◉ M and N category vehicles with GVW ≤ 3500 kg and GVW > 3500 kg
- ○ Agricultural tractors only
- ○ Only electric buses

Q6. What is a key requirement for retro fitment hybrid electric systems under CMVR regulations? **1 3 1**

- ◉ The system must be installed by a government-certified workshop
- ○ The system must be removable within 24 hours
- ○ The vehicle must retain its original fuel system without modification
- ○ The system must be designed for off-road use only

Q7. Which organization in India is responsible for certifying vehicle safety components and ensuring compliance with automotive safety standards? **1 4 1**

- ○ SAE (Society of Automotive Engineers)
- ○ ASME (American Society of Mechanical Engineers)
- ◉ ARAI (Automotive Research Association of India)
- ○ FMVSS (Federal Motor Vehicle Safety Standards)

Q8. What is the primary safety concern related to traction batteries in battery-operated vehicles (BOVs)? **1 4 1**

- ○ Engine overheating
- ◉ Thermal runaway leading to fire hazards
- ○ Excessive fuel consumption
- ○ Increased CO2 emissions

Q9. The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme was launched to provide incentives for- **1 5 1**

- ○ Petrol and diesel vehicles
- ○ Development of hydrogen-powered aircraft
- ◉ Electric and hybrid vehicles for both individual and commercial use
- ○ Increasing toll tax revenue

Q10. According to the NITI Aayog report on Transforming Mobility, what is a key recommendation for India's transportation sector? **1 5 1**

- ○ Expanding coal-based fuel options
- ○ Increasing private vehicle ownership
- ◉ Promoting shared, electric, and connected mobility solutions
- ○ Limiting the use of renewable energy in transportation

Section 2 (Answer any 2 question(s))

Marks CO BL

Q11. Explain the key constructional and functional safety requirements for electric powertrain vehicles. **5 1 2**

Rubric	Marks
constructional safety requirements.	2.5
functional safety requirements.	2.5

Q12. Discuss the methods used to measure the electrical energy consumption of an electric vehicle. **5 1 1**

Rubric	Marks
methods and explanation	5

Q13. Discuss the challenges and solutions in implementing high-power DC fast charging networks for hybrid and electric vehicles. **5 2 1**

Rubric	Marks
solutions	2.5
challenges	2.5

Section 3 (Answer all question(s))

Marks CO BL

Q14. What are the key regulatory requirements for obtaining CMVR type approval for Hybrid Electric Vehicles (HEVs) in India? **3 2 2**

Rubric	Marks
key regulatory requirements	3

Q15. (a) Explain the key differences between the type approval process for conventional Internal Combustion Engine (ICE) vehicles and Hybrid Electric Vehicles (HEVs) under CMVR regulations. **7 2 4**

Rubric	Marks
7 differences with explanation	7

(OR)

(b) Describe the working and principle of an Electric Vehicle Conductive AC Charging System with the help of neat sketch. Also Explain its significance in EV charging infrastructure.

Rubric	Marks
working	2
principle	2
significance	2
sketch	1

Section 4 (Answer all question(s))

Marks CO BL

Q16. What are the key CMVR regulations governing the retro fitment of hybrid electric systems on M and N category vehicles? **3 3 2**

Rubric	Marks
3 key regulations with explanations	3

Q17. (a) Compare the type approval process for retrofitted hybrid systems in light-duty (GVW ≤ 3500 kg) and heavy-duty (GVW > 3500 kg) vehicles. **7 3 4**

Rubric	Marks
7 comparision each 1 marks	7

(OR)

(b) What are the performance, safety, and emission compliance requirements for obtaining CMVR type approval for a hybrid retrofit system?

Rubric	Marks
performance	2
safety	2
emission compliance	3

Section 5 (Answer all question(s))

Marks CO BL

Q18. What are vehicle safety standards, and why are they essential for the automotive industry? **4 4 2**

Rubric	Marks
vehicle safety standards definition	2
why essential	2

Q19. (a) Discuss the safety standards set by SAE (Society of Automotive Engineers) and their impact on vehicle design. **6 4 4**

Rubric	Marks
safety standards	3
Impact	3

(OR)

(b) How do vehicle emissions contribute to environmental pollution? Explain the regulatory measures taken to control them.

Rubric	Marks
How do vehicle emissions contribute to environmental pollution	3
Explain the regulatory measures taken to control them?	3

Section 6 (Answer all question(s))

Marks CO BL

Q20. What is the National Electric Mobility Mission Plan (NEMMP) 2020? What were its key objectives? **4 5 2**

Rubric	Marks
definition	2
objectives	2

Q21. (a) Explain the differences between FAME I and FAME II in terms of scope, incentives, and coverage. **6 5 4**

Rubric	Marks
FAME I	3
FAME II	3

(OR)

(b) Discuss the role of shared mobility, electrification, and alternative fuels in NITI Aayog's vision for India's future transport sector.

Rubric	Marks
Shared mobility	2
electrification	2
Alternative fuel	2

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