Total No. of Questions: 22

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

AU3CO36 MAT Lab for Electric vehicle

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 type of electric vehicle uses both a gasoline engine and an electric motor but cannot be plugged in for charging?	1	1	1

- ○ Battery Electric Vehicle (BEV)
- ◉ Hybrid Electric Vehicle (HEV)
- ○ Plug-in Hybrid Electric Vehicle (PHEV)
- ○ None of the above

Q2.	What function is used to clear all variables from the MATLAB workspace?	1	1	1

- ◉ Clear all
- ○ clc
- ○ close all
- ○ reset

Q3.	Which of the following is a key component of a vehicle dynamics model in Simulink?	1	2	1

- ○ Engine model
- ○ Tire model
- ○ Suspension model
- ◉ All of the above

Q4.	Which MATLAB toolbox is commonly used for battery modeling and simulation?	1	2	1

- ◉ Simscape electrical
- ○ Image processing toolbox
- ○ Deep learning toolbox
- ○ Statistics and Machine Learning Toolbox

Q5.	Which of the following power electronic devices is most commonly used in electric vehicle motor drives?	1	3	1

- ○ Diode
- ◉ Insulated Gate Bipolar Transistor (IGBT)
- ○ Zener diode
- ○ Resistor

Q6.	Which block in MATLAB Simscape Electrical is used to measure voltage across a circuit component?	1	3	1

- ◉ Voltage sensor
- ○ Current sensor
- ○ Scope
- ○ PID controller

Q7.	In MATLAB Simulink, which block is used to implement control logic for smart charging?	1	4	1

- ○ PID controller block
- ○ Lookup table block
- ◉ Stateflow block
- ○ Voltage sensor block

Q8.	Which of the following power grid issues can EV integration help mitigate?	1	4	1

- ○ Voltage fluctuations
- ○ Grid frequency regulation
- ○ Renewable energy intermittency
- ◉ All of the above

Q9.	Which of the following is a key benefit of V2G technology?	1	5	1

- ○ Increases the strain on the power grid
- ○ Reduces the integration of renewable energy
- ◉ Supports grid stability and load balancing
- ○ Decreases the efficiency of EV batteries

Q10. Which new charging technology is gaining popularity for EVs? **1 5 1**

- ○ Slow AC charging
- ◉ Wireless (inductive) charging
- ○ Fossil fuel-based charging
- ○ Manual energy transfer

Section 2 (Answer all question(s))

Q11. How does an electric vehicle differ from a conventional gasoline vehicle? **Marks CO BL** **2 1 1**

Rubric	Marks
Any 4 differences between electric vehicle and gasoline vehicle	2

Q12. Define regenerative braking and explain its benefit. **3 1 1**

Rubric	Marks
Definition	1
Benefits (any 2)	2

Q13. (a) Explain how Hybrid Electric Vehicles (HEVs) use both an internal combustion engine (ICE) and an electric motor? **5 1 2**

Rubric	Marks
Explanation	5

(OR)

(b) What are the different types of operators used in MATLAB? Provide examples of each.

Rubric	Marks
Different type of operators	2
Examples of each.	3

Section 3 (Answer all question(s))

Q14. What are the main components involved in modeling EV dynamics? **Marks CO BL** **2 2 1**

Rubric	Marks
Components involved in modeling EV dynamics	2

Q15. (a) Explain the importance of vehicle modeling in electric vehicle (EV) design and analysis. How does MATLAB Simulink help in this process? **8 2 2**

Rubric	Marks
Importance of vehicle modeling in electric vehicle (EV) design and analysis	5
How does MATLAB Simulink help in this process?	3

(OR)

(b) Explain the working of the equivalent circuit model (ECM) for lithium-ion batteries. How can it be implemented in MATLAB Simulink?

Rubric	Marks
Working of the equivalent circuit model (ECM) for lithium-ion batteries	5
How can it be implemented in MATLAB Simulink?	3

Section 4 (Answer all question(s))

Marks CO BL

Q16. Write different types of electric motors and their applications. 3 3 1

Rubric	Marks
Different types of electric motor	1
Their applications	2

Q17. (a) Explain the role of MATLAB and Simulink in power electronics circuit simulations. How do they help in the analysis and design of power converters? 7 3 4

Rubric	Marks
Role of MATLAB and Simulink in power electronics circuit simulations	4
How do they help in the analysis and design of power converters?	3

(OR)

(b) Explain how can motor control algorithms be implemented in MATLAB.

Rubric	Marks
Explanation in detail	7

Section 5 (Answer all question(s))

Marks CO BL

Q18. What are the different methods of charging an EV? Explain any one of them. 4 4 2

Rubric	Marks
Different methods of charging an EV	4

Q19. (a) Discuss the model of the smart charging algorithm simulated in MATLAB. 6 4 2

Rubric	Marks
Discussion on the model of smart charging algorithm simulated in MATLAB	6

(OR)

(b) What are the different motor control strategies and their applications?

Rubric	Marks
Different motor control strategies	3
Applications	3

Section 6 (Answer any 2 question(s))

Marks CO BL

Q20. What is Vehicle-to-Grid (V2G) technology? How does it work? 5 5 2

Rubric	Marks
What is Vehicle-to-Grid (V2G) Technology	2
How does it work	3

Q21. What are autonomous electric vehicles? How do they work? **5 5 2**

Rubric	Marks
What are autonomous vehicles?	2
How do they work?	3

Q22. Explain how can MATLAB be used to solve a real-world electric vehicle problem. **5 5 1**

Rubric	Marks
Explanation	5

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