

Faculty of Engineering

End Semester Examination May 2025

AU3CO60 Electric Vehicle Technology

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 hybrid electric drive train uses both the internal combustion engine and electric motor to directly drive the vehicle's wheels?				1 1 1
<input type="radio"/> Series Hybrid		<input checked="" type="radio"/> Parallel Hybrid		
<input type="radio"/> Range-Extended Hybrid		<input type="radio"/> Plug-in Hybrid		
Q2. Which motor type is known for its high efficiency and compact design in electric propulsion units?				1 1 1
<input type="radio"/> Induction Motor		<input type="radio"/> DC Motor		
<input checked="" type="radio"/> Permanent Magnet Motor		<input type="radio"/> Switched Reluctance Motor		
Q3. What does the term "V2G" stand for in the context of electric vehicles?				1 2 1
<input checked="" type="radio"/> Vehicle to Grid		<input type="radio"/> Voltage to Ground		
<input type="radio"/> Vehicle to Generator		<input type="radio"/> Vehicle to Garage		
Q4. Which factor is most critical in determining the sizing of an electric vehicle's drive system?				1 2 1
<input type="radio"/> Tire pressure		<input checked="" type="radio"/> Required torque and power output		
<input type="radio"/> Vehicle color		<input type="radio"/> GPS location		
Q5. Which government initiative in India focuses on promoting electric mobility and manufacturing of EVs?				1 3 1
<input type="radio"/> Make in India		<input checked="" type="radio"/> FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles)		
<input type="radio"/> Digital India		<input type="radio"/> Swachh Bharat Abhiyan		
Q6. Which technology is essential for enabling Connected Mobility solutions?				1 3 1
<input checked="" type="radio"/> Internet of Things (IoT)		<input type="radio"/> Hydraulic systems		
<input type="radio"/> Manual transmission		<input type="radio"/> Fuel-based engines		
Q7. Which policy measure can encourage the adoption of EVs in urban infrastructure?				1 4 3
<input checked="" type="radio"/> Tax incentives for EV buyers		<input type="radio"/> Increasing fossil fuel subsidies		
<input type="radio"/> Reducing the number of charging stations		<input type="radio"/> Increasing import duties on batteries		
Q8. Which social factor is most likely to influence EV adoption in rural areas?				1 4 1
<input type="radio"/> Availability of high-speed internet		<input checked="" type="radio"/> Accessibility to reliable charging infrastructure		
<input type="radio"/> Number of luxury vehicles		<input type="radio"/> Internet advertising campaigns		
Q9. Which technology did the University of Delaware utilize to demonstrate how electric vehicles can stabilize the power grid?				1 5 2
<input type="radio"/> Autonomous Driving Systems		<input checked="" type="radio"/> Vehicle-to-Grid Technology		
<input type="radio"/> Hydrogen Fuel Cells		<input type="radio"/> Smart Traffic Systems		

Q10. What was a key factor that contributed to the success of the EV car-sharing program in rural France?

1 5 3

- Introduction of luxury EV models
- Availability of affordable and accessible electric vehicles
- Increase in fuel prices
- Tax subsidies for gas vehicles

Section 2 (Answer all question(s))

Marks CO BL

Q11. Compare the architectures of series and parallel hybrid electric drive trains in terms of their efficiency, complexity and control strategies.

3 1 3

Rubric	Marks
Comparison of architecture of series and parallel hybrid electric drive trains in terms of efficiency.	1
Compare the architectures of series and parallel hybrid electric drive trains in terms of their complexity.	1
Compare the architectures of series and parallel hybrid electric drive trains in terms of their control strategies.	1

Q12. (a) Evaluate the advantages and limitations of using switched reluctance motors in electric vehicles compared to induction and permanent magnet motors.

7 1 3

Rubric	Marks
Evaluate the advantages and limitations of using switched reluctance motors in electric vehicles compared to induction motors.	3.5
Evaluate the advantages and limitations of using switched reluctance motors in electric vehicles compared to permanent magnet motors.	3.5

(OR)

(b) Explain the role of energy storage systems in hybrid electric vehicles. Discuss how they impact overall vehicle efficiency.

Marks CO BL

Rubric	Marks
Explain the role of energy storage systems in hybrid electric vehicles	3
Discuss how they impact overall vehicle efficiency.	4

Section 3 (Answer all question(s))

Q13. Compare battery-based and fuel cell-based energy storage systems in terms of efficiency, environmental impact and suitability for electric vehicles.

3 2 4

Rubric	Marks
Compare battery-based and fuel cell-based energy storage systems in terms of efficiency	1
Compare battery-based and fuel cell-based energy storage systems in terms of environmental impact	1
Compare battery-based and fuel cell-based energy storage systems in terms of suitability	1

Q14.(a) Explain the concepts of V2G (Vehicle to Grid), G2V (Grid to Vehicle), V2B (Vehicle to Building) and V2H (Vehicle to Home). Discuss their potential impact on smart energy systems.

7 2 4

Rubric	Marks
Explain the concepts of V2G (Vehicle to Grid), G2V (Grid to Vehicle), V2B (Vehicle to Building) and V2H (Vehicle to Home)	4.5
discuss their potential impact on smart energy systems	2.5

(OR)

- (b)** Design a conceptual model for the hybridization of energy storage devices in an electric vehicle, considering the integration of batteries and supercapacitors.

Rubric	Marks
Design of a conceptual model for the hybridization of energy storage devices in an electric vehicle	5
Considering the integration of batteries and supercapacitors.	2

Section 4 (Answer all question(s))

Marks CO BL

Q15. Evaluate the role of Connected and Autonomous Mobility in transforming India's transportation landscape, with examples of global case studies.

4 3 5

Rubric	Marks
Evaluate the role of Connected and Autonomous Mobility in transforming India's transportation landscape	3
Examples of global case studies.	1

Q16.(a) Design a roadmap for accelerating the adoption of electric vehicles in India, addressing infrastructure, policy and market challenges.

6 3 6

Rubric	Marks
Design a roadmap for accelerating the adoption of electric vehicles in India, addressing infrastructure	2
Design a roadmap for accelerating the adoption of electric vehicles in India, addressing policy	2
Design a roadmap for accelerating the adoption of electric vehicles in India, addressing market challenges.	2

(OR)

- (b)** Discuss a successful international case study of e-mobility. Analyze how its strategies can be adapted to the Indian market.

Marks CO BL

Rubric	Marks
Discuss a successful international case study of e-mobility	3
Analyze how its strategies can be adapted to the Indian market.	3

Section 5 (Answer all question(s))

Marks CO BL

Q17. Evaluate the social implications of widespread EV adoption in India, particularly in terms of accessibility, affordability and community impact. 3 4 5

Rubric	Marks
Evaluate the social implications of widespread EV adoption in India in terms of accessibility	1
Evaluate the social implications of widespread EV adoption in India, in terms of affordability	1
Evaluate the social implications of widespread EV adoption in India, particularly in terms of community impact.	1

Q18.(a) Propose a policy framework for encouraging the integration of EVs into urban infrastructure systems, focusing on sustainability and scalability. 7 4 3

Rubric	Marks
Propose a policy framework for encouraging the integration of EVs into urban infrastructure systems, focusing on sustainability	3.5
Propose a policy framework for encouraging the integration of EVs into urban infrastructure systems, focusing on scalability.	3.5

(OR)

(b) Discuss how Vehicle-to-Grid (V2G) integration can contribute to a more resilient and efficient power grid. Provide examples of successful implementations.

Rubric	Marks
Discuss how Vehicle-to-Grid (V2G) integration can contribute to a more resilient and efficient power grid.	4
Provide examples of successful implementations.	3

Section 6 (Answer any 2 question(s))

Marks CO BL

Q19. Analyze how the integration of Vehicle-to-Grid (V2G) technology, as demonstrated by the University of Delaware, can contribute to the stability and efficiency of smart grids. 5 5 4

Rubric	Marks
Analyze how the integration of Vehicle-to-Grid (V2G) technology can contribute to the stability of smart grids.	2.5
Analyze how the integration of Vehicle-to-Grid (V2G) technology can contribute to the efficiency of smart grids.	2.5

Q20. Evaluate the impact of affordable and accessible EV initiatives, such as the rural car-sharing program in France, on increasing EV adoption in underserved communities. 5 5 5

Rubric	Marks
Evaluation of the impact of affordable and accessible EV initiatives	5

Q21. Propose strategies to implement a sustainable and socially inclusive EV policy in India, considering the challenges highlighted in the case studies. 5 5 6

Rubric	Marks
Propose strategies to implement a sustainable and socially inclusive EV policy in India	2.5
Considering the challenges highlighted in the case studies.	2.5
