

Enrollment No.....



Faculty of Engineering  
End Sem Examination Dec 2024  
AU3CO32 Hybrid Vehicles

Programme: B.Tech.

Branch/Specialisation: AU

**Duration: 3 Hrs.****Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

		Marks	BL	PO	CO	PSO
Q.1	i. Which of the following components is not common in Electric Vehicle and Hybrid Vehicle? (a) Battery (b) ECU (c) Generator (d) Internal Combustion Engine	1	1	1	2	1,2
	ii. Which symbol is used to represent the coefficient of adhesion in Electric traction? (a) $\phi$ (b) $\lambda$ (c) $\mu$ (d) $\nu$	1	2	1	4	2
	iii. Which type of battery is commonly used in modern electric vehicles due to its high energy density and efficiency? (a) Nickel-Cadmium (NiCd) (b) Lead-Acid (c) Lithium-Ion (Li-ion) (d) Alkaline	1	2	2	3	1,2
	iv. Which of the following converts energy from the combustion of fuel directly to the electrical energy? (a) Ni-Cd cell (b) Dynamo (c) Fuel Cell (d) Electrolytic Cell	1	2	2	2	1
	v. Which among the following is not a factor affecting the charging of the battery? (a) State of charge (b) Gassing (c) Temperature (d) Discolouring of electrolyte	1	2	3	2	1,2

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vi.	In which of the following type battery sources are connected to increase the output voltage?	<b>1</b>	1	3	6	2
	(a) Inclined					
	(b) Series					
	(c) Parallel					
	(d) Series-Parallel					
vii.	The frequency of the rotor current in an induction motor is equal to-	<b>1</b>	3	4	2	1,2
	(a) Slip $\times$ input frequency					
	(b) Slip $\times$ stator current					
	(c) Half of the input frequency					
	(d) The stator current					
viii.	Which is known as the rotating part of DC Motor?	<b>1</b>	1	4	3	2
	(a) Pole					
	(b) Stator					
	(c) Rotor					
	(d) Pole Shoe					
ix.	In which period the power supply to the motor is cut-off and the train is allowed to run due to its own momentum?	<b>1</b>	2	5	4	1
	(a) Free running					
	(b) Notching up					
	(c) Coasting					
	(d) Breaking					
x.	Which of the following is an advantage of electric traction over other methods of traction?	<b>1</b>	2	5	2	1
	(a) Faster acceleration					
	(b) No pollution problems					
	(c) Better braking action					
	(d) All of these					
Q.2	i. What do you mean by an electric vehicle? Explain the configuration of electric vehicle in brief.	<b>4</b>	3	1	5	1,2
	ii. Define traction motor and its principle. What are the characteristics of a traction motor?	<b>6</b>	2	1	3	2
OR	iii. Define energy consumption in HEV. Explain the concept of energy consumption in Hybrid Electric Drive Trains.	<b>6</b>	3	1	2	1

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Q.3	i. What do you mean by battery parameters? Explain any two battery parameters in brief.	<b>4</b>	2	2	4	1
	ii. Describe fuel cell also explain its working principle and operation with neat sketch.	<b>6</b>	3	2	3	1
OR	iii. Define Super Capacitors. Explain its applications and advantages in EV.	<b>6</b>	2	2	6	2
Q.4	Attempt any two:					
	i. Explain the various termination methods for battery.	<b>5</b>	2	3	3	1,2
	ii. What is the design & applications of Z-converter for battery charging?	<b>5</b>	4	3	4	2
	iii. What is the process of charging from grid? Explain in detail.	<b>5</b>	3	3	2	1
Q.5	i. What is the meaning of Electric Propulsion? Explain in brief.	<b>2</b>	2	4	6	1
	ii. Explain DC Motor drive. Also explain various speed control methods of DC Motor drive.	<b>8</b>	2	4	3	1,2
OR	iii. Explain the working and benefits of switched reluctance motor drive for electric vehicles with neat sketch.	<b>8</b>	3	4	2	1
Q.6	Attempt any two:					
	i. Explain the control strategies used in Series Hybrid Electric Drive Train Design.	<b>5</b>	3	5	5	1
	ii. Define Power Rating of traction motor. What are the parameters which affect the power rating?	<b>5</b>	3	5	2	1,2
	iii. What are the various operating patterns of Hybrid Electric Drive? Explain in detail.	<b>5</b>	2	5	3	1,2

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**Marking Scheme**  
**AU3CO32 (T) Hybrid Vehicles (T)**

Q.1	i)	(d) Internal Combustion Engine	1
	ii)	(c) $\mu$	1
	iii)	(c) Lithium-Ion (Li-ion)	1
	iv)	(c) Fuel Cell	1
	v)	(d) Discolouring of electrolyte	1
	vi)	(b) Series	1
	vii)	(a) slip $\times$ input frequency	1
	viii)	(c) Rotor	1
	ix)	(c) Coasting	1
	x)	(a) Faster acceleration	1
Q.2	i.	What do you mean by an electric vehicle? – 2 Mark Explain the configuration of electric vehicle in brief? – 2 Mark	4
	ii.	Define traction motor and its principle. – 2 Mark What are the characteristics of a traction motor? – 4 Mark	6
	OR iii.	Define energy consumption in HEV. – 2 Mark Explain the concept of energy consumption in Hybrid Electric Drive Trains. – 4 Mark	6
Q.3	i.	What do you mean by battery parameters? – 1 Mark Explain any two battery parameters in brief. – 3 Mark	4
	ii.	Describe fuel cell – 2 Mark also explain its working principle and operation with neat sketch. – 4 Mark	6
OR	iii.	Define Super Capacitors. – 2 Mark Explain its applications and advantages in EV. – 4 Mark	6

Q.4	Attempt any two:		
	i.	Explain the various termination methods for battery. – 5 Mark	5
	ii.	What is the design – 3 Mark & applications of Z-converter for battery charging? – 2 Mark	5
OR	iii.	What is the process of charging from grid? Explain in detail. – 5 Mark	5
Q.5	i.	What is the meaning of Electric Propulsion? Explain in brief. – 2 Mark	2
	ii.	Explain DC Motor drive. – 3 Mark Also explain various speed control methods of DC Motor drive. – 5 Mark	8
OR	iii.	Explain the working – 4 Mark and benefits of switched reluctance motor drive for electric vehicles with neat sketch. – 4 Mark	8
Q.6	Attempt any two:		
	i.	Explain the control strategies used in Series Hybrid Electric Drive Train Design. – 5 Mark	5
	ii.	Define Power Rating of traction motor. – 2 Mark What are the parameters which affect the power rating? – 3 Mark	5
	iii.	What are the various operating patterns of Hybrid Electric Drive? Explain in detail. – 5 Mark	5

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