

		[4]				
Q.5	i.	How do sensors, cameras and radar work together to enhance vehicle safety and prevent accidents?	4	2	3	4 1,2
	ii.	Analyze the common causes of rear-end collisions. What role do driver behavior, vehicle speed, and road conditions play in increasing the likelihood of such accidents? What strategies can be implemented to reduce them?	6	3	5	4 1,2
OR	iii.	Discuss the interaction between object detection systems and braking systems in vehicles. How do these systems work together to enhance safety? What are the benefits of automatic braking in preventing collisions?	6	3	5	4 1,2
Q.6	Attempt any two:					
	i.	Discuss the significance of adjustable steering and mirror systems in modern vehicles. How do these features contribute to driver comfort, safety, and overall driving experience?	5	2	7	5 1,2
	ii.	Explain the functionality of a central locking system. What security benefits does this system provide? How has technology advanced in terms of keyless entry and anti-theft measures?	5	3	3	5 1,2
	iii.	Analyze the importance of a tyre pressure control system in vehicle safety and performance. How does maintaining proper tyre pressure affect fuel efficiency, tyre lifespan, and overall driving safety?	5	4	5	5 1,2

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Total No. of Questions: 6

Total No. of Printed Pages:4

Enrollment No.....



Faculty of Engineering  
End Sem Examination Dec 2024  
AU3EL02 Automotive Safety Systems

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.	What is the primary purpose of a crumple zone in vehicle design?	1	1	3	1	1,2
		(a) To enhance vehicle aesthetics					
		(b) To increase the vehicle's weight					
		(c) To absorb and dissipate energy during a collision					
		(d) To improve fuel efficiency					
	ii.	In the context of vehicle safety, what does the term "safety sandwich construction" refer to?	1	1	5	1	1,2
		(a) A type of engine layout					
		(b) A multi-layered structure designed to absorb impact energy					
		(c) The arrangement of seats in a vehicle					
		(d) A method of fuel storage					
	iii.	What is the primary focus of passive safety in vehicle design?	1	2	3	2	1,2
		(a) To assist the driver in avoiding accidents					
		(b) To minimize the consequences of an accident when it occurs					
		(c) To improve fuel efficiency					
		(d) To enhance vehicle performance					
	iv.	Which of the following is an example of an active safety feature in a vehicle?	1	2	3	2	1,2
		(a) Airbags					
		(b) Anti-lock Braking System (ABS)					
		(c) Crumple zones					
		(d) Seat belts					

P.T.O.

[2]					
v.	What is the primary function of an automatic seat belt tightener system?	<b>1</b>	2	5	3 1,2
	(a) To adjust the seat position				
	(b) To increase fuel efficiency				
	(c) To reduce slack in the seat belt during a collision				
	(d) To enhance audio system performance				
vi.	Which of the following components is designed to absorb impact energy during a collision and protect occupants?	<b>1</b>	2	3	3 1,2
	(a) Collapsible steering column				
	(b) Automatic seat belt tightener				
	(c) Airbags				
	(d) Bumper design				
vii.	What is the primary function of a collision warning system in vehicles?	<b>1</b>	1	7	4 1,2
	(a) To enhance engine performance				
	(b) To alert the driver of potential collisions				
	(c) To improve fuel efficiency				
	(d) To increase vehicle speed				
viii.	Which of the following is a common cause of rear-end collisions?	<b>1</b>	1	7	4 1,2
	(a) Driving at high speeds				
	(b) Weather conditions				
	(c) Distracted driving				
	(d) All of these				
ix.	What is the primary purpose of a central locking system in vehicles?	<b>1</b>	1	3	5 1,2
	(a) To enhance fuel efficiency				
	(b) To allow simultaneous locking and unlocking of all doors				
	(c) To improve engine performance				
	(d) To adjust tyre pressure				
x.	What does a tyre pressure control system primarily monitor?	<b>1</b>	1	5	5 1,2
	(a) Engine temperature (b) Fuel level				
	(c) Tyre pressure (d) Brake fluid level				
Q.2 i.	Explain the concept of crumple zones. How they contribute to passenger safety during a collision?	<b>2</b>	2	3	1 1,2

[3]					
ii.	What design features are typically included in crumple zones?	<b>3</b>	2	5	1 1,2
iii.	Describe the role of deceleration of the vehicle inside the passenger compartment during an impact. How can vehicle design minimize the forces experienced by occupants?	<b>5</b>	3	5	1 1,2
OR iv.	What are the advantages of using safety sandwich construction in vehicle body design? Discuss the materials commonly used and how they enhance structural integrity and impact resistance.	<b>5</b>	2	5	1 1,2
Q.3 i.	Discuss the role of active safety systems in modern vehicles.	<b>2</b>	1	3	2 1,2
ii.	Explain the concept of passive safety in vehicle design. What are the key elements of passive safety? How do features like crumple zones and airbags work together to protect occupants during a collision?	<b>8</b>	2	7	2 1,2
OR iii.	Analyze the relationship between speed, acceleration characteristics of the passenger compartment, and occupant safety during an impact. How does vehicle design address these factors to reduce injury risk in the event of a collision?	<b>8</b>	3	5	2 1,2
Q.4 i.	What advancements have been made in seat belt technology, such as the automatic seat belt tightener system?	<b>3</b>	1	3	3 1,2
ii.	Explain the functioning of airbags in vehicles. What electronic systems are involved in detecting a collision and activating the airbags? How do these systems ensure that airbags deploy safely and effectively?	<b>7</b>	2	5	3 1,2
OR iii.	Analyze the design considerations for bumpers in relation to vehicle safety. How does bumper design contribute to absorbing impact energy? What regulations exist to ensure that bumpers provide adequate protection for both vehicle occupants and pedestrians?	<b>7</b>	3	7	3 1,2

## Marking Scheme

### AU3EL02 (T) Automotive Safety Systems (T)

Q.1	i)	<b>C) To absorb and dissipate energy during a collision</b>	<b>1</b>	Q.4	i.	What advancements have been made in seat belt technology, such as the automatic seat belt tightener system?	<b>3</b>
	ii)	<b>B) A multi-layered structure designed to absorb impact energy</b>	<b>1</b>		ii.	Explain the functioning of airbags in vehicles. <b>2 M</b>	<b>7</b>
	iii)	<b>B) Anti-lock Braking System (ABS)</b>	<b>1</b>			What electronic systems are involved in detecting a collision and activating the airbags and <b>3M</b>	
	iv)	<b>B) To minimize the consequences of an accident when it occurs</b>	<b>1</b>			how do these systems ensure that airbags deploy safely and effectively? <b>2M</b>	
	v)	<b>C) To reduce slack in the seat belt during a collision</b>	<b>1</b>	OR	iii.	Analyze the design considerations for bumpers in relation to vehicle safety. <b>2M</b>	<b>7</b>
	vi)	<b>C) Airbags</b>	<b>1</b>			How does bumper design contribute to absorbing impact energy and <b>2M</b>	
	vii)	<b>B) To alert the driver of potential collisions</b>	<b>1</b>			what regulations exist to ensure that bumpers provide adequate protection for both vehicle occupants and pedestrians? <b>3M</b>	
	viii)	<b>D) All of the above</b>	<b>1</b>	Q.5	i.	How do sensors, cameras and radar work together to enhance vehicle safety and prevent accidents?	<b>4</b>
	ix)	<b>B) To allow simultaneous locking and unlocking of all doors</b>	<b>1</b>		ii.	Analyze the common causes of rear-end collisions. What role do driver behavior, vehicle speed, and road conditions play in increasing the likelihood of such accidents, and what strategies can be implemented to reduce them?	<b>6</b>
	x)	<b>C) Tire pressure</b>	<b>1</b>		iii.	Discuss the interaction between object detection systems and braking systems in vehicles. How do these systems work together to enhance safety, and what are the benefits of automatic braking in preventing collisions?	<b>6</b>
Q.2	i.	Explain the concept of crumple zones and how they contribute to passenger safety during a collision.	<b>2</b>	OR			
	ii.	What design features are typically included in crumple zones?	<b>3</b>				
	iii.	Describe the role of deceleration of the vehicle inside the passenger compartment during an impact. <b>2 M</b>	<b>5</b>				
OR		How can vehicle design minimize the forces experienced by occupants? <b>3 M</b>		Q.6		Attempt any two:	
	iv.	What are the advantages of using safety sandwich construction in vehicle body design? <b>2 M</b>	<b>5</b>		i.	Discuss the significance of adjustable steering and mirror systems in modern vehicles. How do these features contribute to driver comfort, safety, and overall driving experience?	<b>5</b>
		Discuss the materials commonly used and how they enhance structural integrity and impact resistance. <b>3 M</b>			ii.	Explain the functionality of a central locking system. What security benefits does this system provide, and how has technology advanced in terms of keyless entry and anti-theft measures?	<b>5</b>
Q.3	i.	Discuss the role of active safety systems in modern vehicles.	<b>2</b>	iii.	iii.	Analyze the importance of a tire pressure control system in vehicle safety and performance. How does maintaining proper tire	<b>5</b>
	ii.	Explain the concept of passive safety in vehicle design. <b>3 M</b>					
		What are the key elements of passive safety, and how do features like crumple zones and airbags work together to protect occupants during a collision? <b>5 M</b>	<b>8</b>				
OR		Analyze the relationship between speed, acceleration characteristics of the passenger compartment, and occupant safety during an impact. <b>4 M</b>	<b>8</b>				
		How does vehicle design address these factors to reduce injury risk in the event of a collision? <b>4 M</b>					

[2]  
pressure affect fuel efficiency, tire lifespan, and overall driving  
safety?

[3]

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