

Enrollment No.....



Faculty of Engineering
End Sem Examination Dec-2023
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.

- Q.1 i. Following is a physical model representing humans inside a car- **1**
 (a) Stiff cage (b) Dummy
 (c) Both (a) and (b) (d) None of these
- ii. Following increases the load on the rear driving wheels, giving them better grip of the road. **1**
 (a) Front engine (b) Rear engine
 (c) Both (a) and (b) (d) None of these
- iii. Prevention of accidents comes under: **1**
 (a) Active safety (b) Passive safety
 (c) Interior safety (d) Exterior safety
- iv. The term "interior safety" covers vehicle measures whose purpose is to minimize the: **1**
 (a) Accelerations and forces (b) Frontal collisions
 (c) Both (a) and (b) (d) None of these
- v. Following is a safety harness designed to secure the occupant of a vehicle against harmful movement that may result from a collision or a sudden stop: **1**
 (a) Seat belt (b) Safety belt
 (c) Both (a) and (b) (d) Adjustable strap
- vi. The maximum forward displacement with tightened seat belts is approx.: **1**
 (a) 2 cm (b) 1 cm (c) 0.5 cm (d) None of these
- vii. One of the main thing drivers can do to avoid rear-end collisions is to maintain a safe following distance is: **1**
 (a) Tailgating (b) Collision warning
 (c) Day dreaming (d) Negligence

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- viii. The software algorithm used for the identification of sharp edges is called: **1**
- (a) Edge detection algorithm
 - (b) Object detection technique
 - (c) Side objects detection
 - (d) Both (a) and (b)
- ix. The sensor which recognizes rain droplets on the windshield, so that the windshield wipers can be triggered automatically is- **1**
- (a) Throttle position sensor
 - (b) Knock Sensor
 - (c) Rain Sensor
 - (d) None of these
- x. Which types of anti-theft devices are available in a vehicle? **1**
- (a) Locking system
 - (b) Disabling devices
 - (c) Alarm systems
 - (d) All of these
- Q.2 i. What do you understand by design of vehicle body for safety? **2**
- ii. What is energy equation? How is it prepared? **3**
- iii. Describe the test at different speeds conducted to understand the deceleration behaviour after the crash with a stationary obstacle. Compare the results also. **5**
- OR iv. What is crumple zone? Explain the functioning and advantages of crumple zone. **5**
- Q.3 i. What is the classification of overall safety of a vehicle? Explain with the help of a block diagram. **4**
- ii. Define active safety and explain its types with suitable examples. **6**
- OR iii. Define passive safety and explain types of exterior safety with suitable examples. **6**
- Q.4 i. Explain the functioning of seat belt tightener for manual and automatic operation. **4**
- ii. Why are air bags provided in vehicles? Explain its functioning with suitable diagram. **6**
- OR iii. What is collapsible steering? Explain the functioning of collapsible steering column with suitable diagram and mention its advantages over conventional steering column. **6**

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- Q.5 i. What are the common reasons for causes of rear end collisions explain with suitable examples. **4**
- ii. Explain the layout of object detection techniques and edge detection system with suitable diagram. **6**
- OR iii. What is the objective of collision warning system? Explain its functioning with suitable diagram. **6**
- Q.6 Attempt any two:
- i. What is tire pressure control system? Explain its function and working with suitable diagram. **5**
- ii. Describe the layout and functioning of central locking system with suitable diagram. **5**
- iii. What is the objective of garage door opening system? How it works? Explain in detail with suitable diagram. **5**

Marking Scheme

AU3EL02 (T)- Automotive Safety Systems

Q.1	i)	Following is a physical model representing humans inside a car.	1
		b) Dummy	
	ii)	Following increases the load on the rear driving wheels, giving them better grip of the road.	1
		b) Rear Engine	
	iii)	Prevention of accidents comes under:	1
		a) Active Safety	
	iv)	The term "interior safety" covers vehicle measures whose purpose is to minimize the:	1
		a) accelerations and forces	
	v)	Following is a safety harness designed to secure the occupant of a vehicle against harmful movement that may result from a collision or a sudden stop:	1
		c) Both	
Q.2	vi)	The maximum forward displacement with tightened seat belts is approx.:	1
		b) 1cm	
	vii)	One of the main thing drivers can do to avoid rear-end collisions is to maintain a safe following distance is:	1
		a) Tailgating	
	viii)	The software algorithm used for the identification of sharp edges is called:	1
		a) Edge Detection Algorithm	
	ix)	The sensor which recognizes rain droplets on the windshield, so that the windshield wipers can be triggered automatically is:	1
		c) Rain Sensor	
	x)	Which types of anti-theft devices are available in a vehicle?	1
		((d) All of these	
Q.2	i.	What do you understand by Design of vehicle body for safety?	2
		Definition	-2marks
	ii.	What is energy equation? How is it prepared?	3
		Definition	-1.5 marks
		Explanation	-1.5 marks
	iii.	Describe the test at different speeds conducted to understand the deceleration behaviour after the crash with a stationary obstacle. Compare the results also.	5

OR	iv.	4 types of tests with explanation	- 4marks	5
		Comparison	-1marks	
		What is crumple zone? Explain the functioning and advantages of crumple zone.		
		Definition	-1marks	
Q.3	i.	Function	-2marks	4
		Advantages	-2marks	
		What is the classification of overall safety of a vehicle? Explain with the help of a block diagram.		
		Classification	-2marks	
Q.3	ii.	Diagram	-2marks	6
		Define active safety and explain its types with suitable examples.		
		Definition	-2marks	
		Types	-2marks	
OR	iii.	Examples	-2marks	6
		Define passive safety and explain types of exterior safety with suitable examples.		
		Definition	-2marks	
		Types	-2marks	
Q.4	i.	Examples	-2marks	4
		Explain the functioning of seat belt tightener for manual and automatic operation.		
		Function for manual	-2marks	
		Function for automatic operation	-2marks	
Q.4	ii.	Why are air bags provided in vehicles? Explain its functioning with suitable diagram?		6
		Explanation	-2marks	
		Function	-2marks	
		Diagram	-2marks	
OR	iii.	What is Collapsible Steering? Explain the functioning of Collapsible Steering Column with suitable diagram and mention its advantages over conventional steering column.		6
		Definition	-1mark	
		Diagram	-1mark	
		Function	-2marks	
Q.5	i.	Advantages	-2marks	4
		What are the common reasons for causes of rear end collisions explain with suitable examples.		
		Reasons	-2marks	

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- Examples -2marks
- ii. Explain the layout of Object detection techniques and edge detection system with suitable diagram. **6**
- Diagram -2marks
- Explanation of Object detection techniques -2marks
- Explanation of edge detection system -2marks

Q.6

Attempt any two:

- i. What is Tire Pressure Control system? Explain its function and working with suitable diagram. **5**
- Definition -2marks
- Function -2marks
- Diagram -1mark
- Working -1mark
- ii. Describe the layout and functioning of central locking system with suitable diagram. **5**
- Explanation -2marks
- Function -2marks
- Diagram -1marks
- iii. What is the objective of Garage door opening system and how it works? Explain in detail with suitable diagram. **5**
- Explanation -2marks
- Working -2marks
- Diagram -1mark
