Total No. of Questions: 6 *Total No. of Printed Pages:2*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

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.

Q.1 i. The vehicle body structure is subjected to following service loads during the life cycle- **1**

(a) Static (b) Dynamic
(c) Both (a) and (b) (d) None of these

ii. Following consists of the main energy absorbing structure before the power train- **1**

(a) Soft front zone (b) Primary Crush Zone
(c) Secondary crush zone (d) None of these

iii. Which of the following is a component of passive safety system? **1**

(a) Anti-lock braking system (b) Electronic stability control
(c) Seat belt (d) Traction control

iv. _____ is the result of a harmonious chassis and suspension design with regard to wheel suspension. **1**

(a) Driving safety (b) Conditional safety
(c) Perceptibility safety (d) Operating safety

v. The air bag system needs how much time to inflate completely at a speed of 50 km/hr? **1**

(a) 10 ms (b) 20 ms (c) 30 ms (d) 40ms

vi. Following sensors are used for impact detection in air bag system- **1**

(a) Wheel speed sensor (b) Acceleration sensor
(c) Knock sensor (d) Lambda sensor

vii. The round-trip time in RADAR system is given by following equation- **1**

(a) t=2c/R (b) t=R/2c (c) t=2Rc (d) t=2R/c

viii. The following capture an image of scene occurring exteriorly of the vehicle- **1**

(a) Imaging sensor (b) Image Processor
(c) Control system (d) Imaging system

P.T.O.

ix. 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

x. Tempered glass is used for _____. **1**

(a) Side and rear window glass (b) Auto window and door
(c) Head light (d) All of these

Q.2 i. Write any two necessary features of a safe vehicle body. **2**

ii. What is energy equation? **3**

iii. Explain deceleration of passenger compartment on impact with stationary obstacle with suitable graphs. **5**

OR iv. Explain design strategies to be followed while designing a car body to reduce the frontal impact of crash. **5**

Q.3 i. What do you mean by interior and exterior safety? **2**

ii. Define active safety. Classify and explain active safety types. **8**

OR iii. Explain speed and acceleration characteristics of vehicle body with suitable graphs. **8**

Q.4 i. Define seat belt and belt tightners. **3**

ii. With neat sketch, explain the construction and working of seat belt tightening system. **7**

OR iii. With neat sketch, explain electronic system for activating air bags. **7**

Q.5 i. What is tailgating? How it can be avoided? **4**

ii. Draw and explain layout of object detection technology. **6**

OR iii. Draw and explain object detection system with braking system interactions. **6**

Q.6 Attempt any two:

i. Explain tyre pressure control system with sketch. **5**

ii. Explain the working of rain sensor system with sketch. **5**

iii. Explain garage door opening system with sketch. **5**

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Marking Scheme

AU3EL02 Automotive Safety Systems

Q.1	i.	The vehicle body structure is subjected to following service loads during the life cycle: c)Both	**1**
	ii.	Following consists of the main energy absorbing structure before the power train: b)Primary crush zone	**1**
	iii.	Which of the following is a component of passive safety system? c)Seat belt	**1**
	iv.	……. is the result of a harmonious chassis and suspension design with regard to wheel suspension: a)Driving Safety	**1**
	v.	The air bag system needs how much time to inflate completely at a speed of 50 km/hr? d)40 ms	**1**
	vi.	Following sensors are used for impact detection in air bag system: b)Acceleration sensor	**1**
	vii.	The round trip time in RADAR system is given by following equation: d)t=2R/c	**1**
	viii.	The following capture an image of scene occurring exteriorly of the vehicle: a)Imaging sensor	**1**
	ix.	Which types of anti-theft devices are available in a vehicle? d) All of them	**1**
	x.	Tempered glass is used for _____ a)Side and rear window glass	**1**
Q.2	i.	Write any two necessary features of a safe vehicle body. (2*1=2)	**2**
	ii.	What is energy equation? -3 marks	**3**
	iii.	Explain deceleration of passenger compartment on impact with stationary obstacle with suitable graphs. Explanation -3 Marks Graphs -2 Marks	**5**
OR	iv.	Explain design strategies to be followed while designing a car body to reduce the frontal impact of crash. Detailed explanation -5 Marks	**5**
Q.3	i.	What do you mean by interior and exterior safety? Interior Safety -1 Mark Exterior Safety -1 Mark	**2**
	ii.	Define active safety. Classify and explain active safety types. Define Active safety -2 Marks Classification -1 Marks Explanation of safety systems -5 Marks	**8**
OR	iii.	Explain speed and acceleration characteristics of vehicle body with suitable graphs. Explanation -3 Marks Graphs -5 Marks	**8**
Q.4	i.	Define seat belt and belt tightner. Seat belt -1.5 Marks Belt tightner - 1.5 Marks	**3**
	ii.	With neat sketch, explain the construction and working of seat belt tightening system. Construction -2 Marks Working -3 Marks Sketch -2 Marks	**7**
OR	iii.	With neat sketch, explain electronic system for activating air bags Working -5 Marks Sketch -2 Marks	**7**
Q.5	i.	What is tailgating? How it can be avoided? Tailgating -2 Mark How it can be avoided -2 Marks	**4**
	ii.	Draw and explain layout of object detection technology. Explanation -4 Marks Sketch -2 Marks	**6**
OR	iii.	Object detection system with braking system interactions Explanation -3 Marks Sketch -3 Marks	**6**
Q.6		Attempt any two:	
	i.	Explain tyre pressure control system with sketch. Explanation -3 Marks Sketch -2 Marks	**5**
	ii.	Explain the working of rain sensor system with sketch. Working -3 Marks Sketch -2 Marks	**5**
	iii.	Explain garage door opening system with sketch. Working -3 Marks Sketch -2 Marks	**5**

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