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Printed Page:-4 **Subject Code:- AME0711**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: VII - THEORY EXAMINATION (2025 - 2026)
Subject: Autonomous vehicles

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The full form of (FHWA). (CO1,K1) 1

(a) Federal Highway Administration
(b) Federal Highway Agency
(c) Federal Highway Authority
(d) Federal Highway Applications

1-b. The full form of (FTA). (CO1,K1) 1

(a) Federal Transit Administration
(b) Federal Transport Administration
(c) Federal Traffic Administration
(d) Federal Transport Agency

1-c. Infrastructure maintenance and interactivity with vehicles must have (CO2,K2) 1

(a) Traffic lights and vehicles must talk to each other and roads must be pothole free
(b) Harmonized regulations, and standards for the construction and renovation of roads
(c) Self-driving cars must use vast amounts of data from image recognition systems
(d) Less prepare for a roadside emergency

1-d. Which two engineers would need to collaborate to make a self-driving car? (CO2,K1) 1

(a) civil and mechanical
(b) software and civil
(c) mechanical and software
(d) None of the Above

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1-e. When did engineers first experiment with driverless cars? (CO3,K1) 1

(a) In the 1920s
(b) In the 1950s
(c) In the 1990s
(d) In the 2010s

1-f. The global campaign to make road deaths caused by crashes a thing of the past is called… (CO3,K1) 1

(a) Vision Zero
(b) Stop crashes
(c) Zero road deaths
(d) Zero Vision

1-g. What does the term "kinematic bicycle model" refer to in 2D vehicle modeling? (CO4,K2) 1

(a) Modeling tire-road interactions
(b) Simulating fuel injection systems
(c) Representing a simplified vehicle model with two wheels
(d) Adjusting suspension height

1-h. Which mathematical concept is commonly used to represent the relationship between position, velocity, and acceleration in kinematic modeling? (CO4,K2) 1

(a) Trigonometry
(b) Calculus
(c) Linear algebra
(d) Statistics

1-i. In feedforward speed control, what type of information is used to anticipate disturbances in the system? (CO5,K2) 1

(a) Current speed
(b) Steering angle
(c) Road conditions
(d) Brake pedal position

1-j. What distinguishes feedforward control from feedback control in a speed control system? (CO5,K2) 1

(a) Feedforward does not use sensor information
(b) Feedback is more predictive
(c) Feedback responds only to disturbances
(d) Feedforward does not anticipate disturbances

2. Attempt all parts:-

2.a. Write about the different Levels of Autonomous Driving in detail? (CO1,K2) 2

2.b. What is the impact of autonomous vehicles on traditional transportation industries? (CO2, K4) 2

2.c. How are software updates and improvements implemented in autonomous vehicles? (CO3,K2) 2

2.d.	How is the safety of autonomous vehicles communicated to the public and regulators? (CO4, K2)	2
2.e.	How is cruise control implemented in vehicles for longitudinal control? (CO5,K3)	2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Explain the Hough line detection method and its use in self-driving vehicles. (CO1,K2)	6
3.a.(ii)	Write about RADAR in detail and its application in autonomous vehicles? (CO1,K2)	6

3.b. Answer any one of the following:-

3.b.(i)	How do insurance models need to adapt to accommodate autonomous vehicles? (CO2,K4)	6
3.b.(ii)	What is the role of hardware in self-driving vehicles? (CO2,K2)	6

3.c. Answer any one of the following:-

3.c.(i)	How do self-driving systems prioritize and interpret various sensor inputs? (CO3,K4)	6
3.c.(ii)	How are safety standards established for autonomous vehicles? (CO3,K3)	6

3.d. Answer any one of the following:-

3.d.(i)	How are aerodynamics considered in vehicle dynamic modeling? (CO4,K3)	6
3.d.(ii)	How does vehicle mass distribution impact dynamic behavior? (CO4,K4)	6

3.e. Answer any one of the following:-

3.e.(i)	What factors influence acceleration and deceleration in vehicle longitudinal control? (CO5,K4)	6
3.e.(ii)	How is adaptive cruise control different from traditional cruise control? (CO5,K4)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	How do autonomous vehicles navigate their surroundings? Explain in detail. (CO1,K4)	10
4-b.	What are the levels of autonomy in vehicles, and what do they mean? (CO1,K2)	10

5. Answer any one of the following:-

5-a.	What are the challenges in developing robust and reliable self-driving algorithms? (CO2,K4)	10
5-b.	How do self-driving systems handle edge cases and unexpected scenarios? (CO2,K5)	10

6. Answer any one of the following:-

6-a.	How do autonomous vehicles adapt to unforeseen and dynamic driving conditions? (CO3,K4)	10
6-b.	What documentation and evidence are required to demonstrate the safety of autonomous systems? (CO3,K3)	10

7. Answer any one of the following:-

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7-a.	What methods are used to validate and calibrate vehicle dynamic models? (CO4,K4)	10
7-b.	How does vehicle dynamic modeling contribute to handling and stability analysis? (CO4,K4)	10

8. Answer any one of the following:-

8-a.	What is the significance of anti-lock braking systems (ABS) in longitudinal control? (CO5,K4)	10
8-b.	How are longitudinal control systems designed to handle emergency braking situations? (CO5,K5)	10