A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U7304

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Professional Elective

Mechanical Engineering

21MEV304 -SMART MOBILITY AND INTELLIGENT VEHICLES

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of the following best describes the concept of automotive electronics? CO1-U

   a) Systems focused solely on vehicle entertainment

   b) Electrical systems designed to enhance vehicle performance, safety, and comfort

   c) Mechanical parts of the vehicle, such as the engine and transmission

   d) Only the sensors used in autonomous driving

2. Infotainment systems in modern vehicles primarily serve which purpose? CO1-U

   a) To control the engine's performance

   b) To provide entertainment and information to passengers

   c) To manage fuel consumption

   d) To optimize chassis performance

3. Which of the following sensors uses sound waves to detect obstacles? CO1-U

   a) Radar b) Ultrasonic sonar c) Lidar d) Camera

4. Lidar technology operates using which type of waves? CO1-U

   a) Radio waves b) Ultrasonic waves c) Light waves (laser) d) Infrared waves

5. What is the primary function of an Electronic Control Unit (ECU) in a connected autonomous vehicle? CO1-U

a) To control the vehicle's entertainment system

b) To monitor and manage various vehicle subsystems and their interactions

c) To provide navigation instructions to the driver

d) To regulate tire pressure

6. Which of the following best describes a cyber-physical system in the context of autonomous vehicles? CO1-U

a) A vehicle that operates solely on mechanical systems

b) An integrated system that combines physical components and computational algorithms for real-time monitoring and control

c) A vehicle that requires constant human supervision

d) A traditional gasoline-powered vehicle

7. What is the primary function of the modulation process in wireless communication? CO1-U

a) To decode the received signal

b) To convert digital data into a suitable format for transmission over a wireless medium

c) To amplify the transmitted signal

d) To provide error detection

8. In a wireless system block diagram, what component is responsible for amplifying the transmitted signal? CO1-U

a) Demodulator b) Modulator c) Transmitter d) Receiver

9. What is the primary purpose of Vehicle-to-Vehicle (V2V) communication? CO1-U

a) To enhance the vehicle's entertainment system

b) To allow vehicles to share information about their speed, location, and direction to prevent collisions

c) To monitor engine performance

d) To control vehicle maintenance schedules

10. What is one of the main challenges associated with autonomous vehicles? CO1-U

a) They have lower fuel efficiency

b) They require constant human supervision

c) Legal and regulatory issues regarding liability in accidents

d) They are not equipped with navigation systems

PART – B (5 x 2= 10Marks)

11.	Explain the concept of automotive electronics and its importance in modern vehicles.	CO1-U	
12.	Describe the basic working principle of radar technology in smart mobility applications.	CO2-U	
13.	Explain the basic control system theory as it applies to autonomous vehicles.	CO3-U	
14.	Describe the basic components of a wireless system block diagram in the context of vehicle communication.	CO3-U	
15.	Describe the fundamental concept of connectivity in connected cars and autonomous vehicles.	CO3-U	

PART – C (5 x 16= 80Marks)

16.	(a)	Summarize the main components of infotainment systems in vehicles.	CO1- U	(16)
		Or		
	(b)	Interpret how body, chassis, and power train electronics contribute to vehicle performance.	CO1- U	(16)
17.	(a)	Describe the basic principles of radar technology and its applications in automotive systems.	CO1- U	(16)
		Or		
	(b)	Explain how ultrasonic sonar systems work and their role in vehicle safety.	CO1- U	(16)
18.	(a)	Explain the function of an ECU in controlling different vehicle systems.	CO1- U	(16)
		Or		
	(b)	Classify the components of a Cyber-Physical System (CPS) in an autonomous vehicle.	CO1- U	(16)
19.	(a)	Apply the wireless system block diagram to design a communication system for autonomous vehicles.	CO2- App	(16)
		Or		
	(b)	Use the principles of wireless communication to demonstrate how	CO2- App	(16)

to set up a V2X (Vehicle-to-Everything) communication system.

20.	(a)	Use 5G technology to demonstrate how high-speed data transmission improves vehicle-to-vehicle communication in autonomous driving.	CO2- App	(16)
		Or		
	(b)	Apply GPS and real-time mapping systems to enhance the route planning of a driverless car.	CO2- App	(16)