Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U7101

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

Professional Elective

Mechanical Engineering

21MEV101 Automobile Engineering

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of the following is a primary resistance to vehicle motion? CO1-U

   (a) Rolling resistance (b) Thermal resistance

   (c) Electrical resistance (d) Acoustic resistance

2. Sensors and Actuators for Engine Applications CO1-U

   (a) Oxygen sensor (b) Temperature sensor

   (c) Pressure sensor (d) Speed sensor

3. Why is a gearbox necessary in a vehicle? CO1-U

   (a) To control steering

   (b) To convert engine speed to wheel speed

   (c) To reduce fuel consumption

   (d) To enhance comfort

4. In which drive system is the propeller shaft mounted to the rear axle using flexible joints? CO1-U

   (a) Torque Tube Drive (b) Hotchkiss Drive

   (c) All-Wheel Drive (d) Front-Wheel Drive

5. Which type of suspension uses a system of springs and dampers? CO1-U

   (a) Rigid axle (b) Independent suspension

   (c) Leaf spring (d) Solid axle

6. Which component is essential in a pneumatic braking system? CO1-U

(a) Master cylinder (b) Brake fluid (c) Air compressor (d) Brake pads

7. What does Selective Catalytic Reduction (SCR) primarily reduce? CO1-U

(a) Carbon dioxide (b) Carbon monoxide

(c) Nitrogen oxides (NOx) (d) Hydrocarbons

8. What is a major safety precaution when handling hydrogen? CO1-U

(a) Keep it in open containers

(b) Use non-metallic materials

(c) Ensure proper ventilation to prevent accumulation

(d) Store it in glass containers

9. Which two power sources are commonly used in hybrid vehicles? CO1-U

(a) Diesel and gasoline

(b) Electric motor and internal combustion engine

(c) Solar panels and hydrogen fuel cells

(d) Natural gas and propane

10. What does biometric vehicle access use for unlocking a vehicle? CO1-U

(a) Remote key fob (b) Fingerprint or facial recognition

(c) Traditional keys (d) Voice commands

PART – B (5 x 2= 10Marks)

11. Define rolling resistance. CO1 -U

12. What is the main function of a differential in a vehicle? CO1 -U

13. How does a recirculating ball steering gearbox work? CO1 -U

14. How do fuel cells generate electricity? CO1-U

15. What is automatic high-beam control? CO1 -U

PART – C (5 x 16= 80Marks)

16. (a) Identify the classification of automobiles based on fuel type, application, and size. Highlight the key differences between electric vehicles, hybrid vehicles, and conventional internal combustion engine vehicles. CO2- App (16)

Or

(b) Make use of the various sensors and actuators used in internal combustion engine (ICE) applications- Explain in detail. CO2- App (16)

17.	(a)	Identify the role and function of a transfer box in four-wheel-drive vehicles. Explain its working principle and discuss how it allows switching between two-wheel and four-wheel drive modes.	CO2- App	(16)
		Or		
	(b)	Compare and contrast the Hotchkiss Drive and Torque Tube Drive. Explain their construction, working principles, and applications in different types of vehicles, highlighting their advantages and disadvantages.	CO2- App	(16)
18.	(a)	Construct the different types of steering gearboxes used in vehicles and compare their working principles, advantages, and applications in modern automobiles.	CO2- App	(16)
		Or		
	(b)	Identify the working principle of a hydraulic braking system and compare hydraulic brakes with mechanical braking systems.	CO2- App	(16)
19.	(a)	Identify the use of bio-ethanol and gasohol as alternative fuels in automotive engines and compare their benefits and drawbacks in terms of engine performance, emissions reduction, and sustainability.	CO3- App	(16)
		Or		
	(b)	Construct the Selective Catalytic Reduction (SCR) system used for NOx emission control in diesel engines. Explain its working principle, the role of urea or ammonia in the process, and the benefits of SCR in meeting stringent emission regulations.	CO3- App	(16)
20.	(a)	Identify the components and operation of electric vehicles (EVs) and discuss the challenges related to battery technology, charging infrastructure, and range anxiety.	CO4- App	(16)
		Or		
	(b)	Make use of the concept of the Internet of Things (IoT) for vehicles. Discuss its applications in connected vehicles, vehicle-to-infrastructure communication, and predictive maintenance, and analyze how IoT is transforming the driving experience and vehicle management.	CO4- App	(16)