

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK



VI SEMESTER

PME 204 VEHICLE HEALTH, MAINTENANCE AND SAFETY

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Prepared by

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| UNIT – I INTRODUCTION | | | |
|--|---|---|-------------------|
| Need for Maintenance – importance, classification of maintenance work-basic problem diagnosis. Maintenance of vehicle systems – power pack, tyres, safety systems. Scheduled maintenance services – service intervals – On-board diagnostics, Computerized engine analyzer study and practice- OBD and scan tools. | | | |
| PART A (2 Marks) | | | |
| 1 | Define maintenance and state its importance. | 1 | Remember |
| 2 | Classify types of maintenance work. | 1 | Remember |
| 3 | List basic steps in problem diagnosis. | 1 | Remember |
| 4 | Explain need for scheduled maintenance services. | 2 | Understand |
| 5 | Describe service intervals for vehicles. | 2 | Understand |
| 6 | What is On-board diagnostics (OBD)? | 1 | Remember |
| 7 | Differentiate OBD from engine analyzers. | 2 | Understand |
| 8 | State purpose of scan tools in maintenance. | 1 | Remember |
| 9 | List vehicle systems needing maintenance. | 1 | Remember |
| 10 | Explain maintenance for safety systems. | 2 | Understand |
| 11 | Define OBD-III and its role. | 1 | Remember |
| 12 | What are DTCs in vehicle diagnostics? | 1 | Remember |
| 13 | Describe tyre maintenance basics. | 2 | Understand |
| 14 | List power pack maintenance factors. | 1 | Remember |
| 15 | Explain maintenance role in longevity. | 2 | Understand |
| 16 | Differentiate preventive vs corrective maintenance. | 2 | Understand |
| 17 | What is basic fault diagnosis procedure? | 1 | Remember |
| 18 | Describe engine analyzer functions. | 2 | Understand |
| 19 | List safety system maintenance checks. | 1 | Remember |
| 20 | Explain maintenance classification. | 2 | Understand |
| 21 | State tyre maintenance importance. | 2 | Understand |
| 22 | Describe OBD scan tool applications. | 2 | Understand |
| 23 | What are scheduled service intervals? | 1 | Remember |
| 24 | List power pack components for maintenance. | 1 | Remember |
| 25 | Define vehicle health monitoring. | 1 | Remember |

| PART B (16 MARKS) | | | |
|--------------------------|---|--------|------------------------------|
| 1 | (a) With a neat sketch, explain the need for maintenance and its classification . (8) (b) Discuss the procedure for basic fault diagnosis in vehicle systems. (8) | 3 | Apply |
| 2 | Explain the working of On-Board Diagnostics (OBD) and computerized engine analyzers using scan tools. (16) | 4 | Analyze |
| 3 | (a) Describe scheduled maintenance services and service intervals . (8) (b) Elaborate on maintenance practices for power pack, tyres, and safety systems . (8) | 2 3 | Understand, Apply |
| 4 | With relevant diagrams, explain OBD-III, DTC identification, and emission control servicing . (16) (Diagrams required) | 3,4 | Apply, Analyze: |
| 5 | Discuss the importance of vehicle health monitoring and maintenance strategies for longevity . (16) | 5 | Evaluate |
| 6 | Compare preventive and corrective maintenance with suitable examples from vehicle systems. (16) | 4 | Analyze |
| 7 | Explain the role of scan tools in modern vehicle diagnostics with practical applications. (16) | 3 | Apply |
| 8 | Design a comprehensive maintenance checklist for power pack and safety systems . (16) | 3 | Apply |
| 9 | Analyze the impact of proper service intervals on vehicle performance and reliability . (16) | 4 | Analyze |
| 10 | Evaluate different diagnostic tools – OBD vs computerized analyzers – for fault detection . (16) | 5 | Evaluate |
| 11 | With flowcharts, explain fault diagnosis procedures for common vehicle faults . (16) (Flowchart required) | 3 | Apply |
| 12 | Discuss tyre maintenance practices including rotation and safety system integration . (16) | 3 | Apply |
| 13 | Analyze OBD data interpretation techniques for emission-related faults . (16) | 4 | Analyze |
| 14 | Design a training module for vehicle maintenance covering all key systems. (16) | 3 | Apply |
| 15 | Evaluate the effectiveness of scheduled maintenance in preventing vehicle breakdowns. (16) | 5 | Evaluate |
| 16 | Compare traditional manual diagnostics with modern computerized engine analyzers . (16) | 4 | Analyze |
| 17 | Explain maintenance procedures for vehicle safety systems with practical examples. (16) | 3 | Apply |
| 18 | Design a fault diagnosis protocol using OBD scan tools for power pack systems . (16) | 3 | Apply |

UNIT – II POWERTRAIN MAINTENANCE

Exhaust emission test of petrol and diesel engine; - Electronic fuel injection and engine management service - fault diagnosis- OBD-III and scan tool, identifying DTC and servicing emission controls, Maintenance of Batteries, Starting System, Charging System and Body Electrical -Fault Diagnosis Using Scan Tools.

PART A (2 Marks)

| | | | |
|----|---|---|-------------------|
| 1 | Define exhaust emission tests for petrol engines. | 1 | Remember |
| 2 | List diesel engine emission testing steps. | 1 | Remember |
| 3 | What is Electronic Fuel Injection (EFI) service? | 1 | Remember |
| 4 | Explain engine management system basics. | 2 | Understand |
| 5 | Describe OBD-III fault diagnosis process. | 2 | Understand |
| 6 | State role of scan tools in powertrain. | 1 | Remember |
| 7 | Define DTC and its identification. | 1 | Remember |
| 8 | List emission control servicing steps. | 1 | Remember |
| 9 | What is battery maintenance? | 1 | Remember |
| 10 | Explain starting system components. | 2 | Understand |
| 11 | Describe charging system functions. | 2 | Understand |
| 12 | What is body electrical maintenance? | 1 | Remember |
| 13 | List powertrain fault diagnosis tools. | 1 | Remember |
| 14 | Define petrol engine emission norms. | 1 | Remember |
| 15 | Explain diesel emission test procedures. | 2 | Understand |
| 16 | State EFI fault diagnosis methods. | 1 | Remember |
| 17 | Describe scan tool use in batteries. | 2 | Understand |
| 18 | List DTC types in powertrain. | 1 | Remember |
| 19 | Explain emission control servicing. | 2 | Understand |
| 20 | Define starting system maintenance. | 1 | Remember |
| 21 | Describe charging system checks. | 2 | Understand |
| 22 | What are body electrical faults? | 1 | Remember |
| 23 | List powertrain maintenance schedules. | 1 | Remember |
| 24 | Explain battery fault diagnosis. | 2 | Understand |
| 25 | Define EFI management service. | 1 | Remember |

| PART B (16 MARKS) | | | |
|--------------------------|---|------------|--------------------|
| S.No | Question | BTL | Explanation |
| 1 | (a) Explain exhaust emission testing procedures for petrol and diesel engines.(8) (b) Describe Electronic Fuel Injection (EFI) service and fault diagnosis. (8) | 3 | Apply |
| 2 | With neat sketches, explain OBD-III scan tool applications in powertrain diagnosis.(16) | 3 | Apply |
| 3 | (a) Discuss battery maintenance and starting system service procedures.(8) (b) Explain charging system fault diagnosis using scan tools. (8) | 3 | Apply |
| 4 | Elaborate on DTC identification, emission control servicing, and body electrical maintenance. (16) | 3 | Apply |
| 5 | Explain engine management system diagnostics and EFI service procedures. (16) | 4 | Analyze |
| 6 | Compare emission testing methods for petrol vs diesel engines with standards. (16) | 4 | Analyze |
| 7 | Design a comprehensive powertrain maintenance checklist and service protocol. (16) | 3 | Apply |
| 8 | Analyze powertrain fault diagnosis procedures using modern scan tools. (16) | 4 | Analyze |
| 9 | Discuss battery maintenance impact on vehicle reliability and starting performance. (16) | 5 | Evaluate |
| 10 | Explain step-by-step EFI service procedures with fault diagnosis techniques. (16) | 3 | Apply |
| 11 | Evaluate scan tool effectiveness in diagnosing body electrical and charging faults. (16) | 5 | Evaluate |
| 12 | Compare OBD tool applications in powertrain vs other vehicle systems. (16) | 4 | Analyze |
| 13 | Design fault diagnosis protocol for starting and charging electrical systems. (16) | 3 | Apply |
| 14 | Analyze engine management system diagnostics with practical case studies. (16) | 4 | Analyze |
| 15 | Explain emission control system servicing and compliance maintenance strategies. (16) | 3 | Apply |
| 16 | Design a powertrain health monitoring system using OBD-III technology. (16) | 3 | Apply |
| 17 | Evaluate emission control maintenance impact on environmental compliance. (16) | 5 | Evaluate |
| 18 | Analyze charging system failures, diagnosis, and remedial measures. (16) | 4 | Analyze |

UNIT – III VEHICLE SYSTEM MAINTENANCE

Clutch- adjustment and service, Maintenance and Service of Hydraulic brake, Bleeding of brakes, Checking ABS and components. Maintenance and Service of McPherson strut, coil spring. tyre wear, measurement of read depth and tyre rotation, Computerized wheel balancing & wheel alignment, Maintenance and Service of steering linkage, steering column, Rack and pinion steering.

PART A (2 Marks)

| | | | |
|----|---------------------------------------|---|-------------------------------|
| 1 | Define clutch adjustment procedures. | 1 | Remember |
| 2 | List clutch service steps. | 1 | Remember |
| 3 | Explain hydraulic brake maintenance. | 2 | Understand Explain |
| 4 | Describe brake bleeding process. | 2 | Understand |
| 5 | What is ABS component checking? | 1 | Remember |
| 6 | State McPherson strut service. | 1 | Remember |
| 7 | Define coil spring maintenance. | 1 | Remember |
| 8 | Explain tyre wear indicators. | 2 | Understand |
| 9 | Describe tread depth measurement. | 2 | Understand |
| 10 | What is tyre rotation method? | 1 | Remember |
| 11 | List wheel balancing steps. | 1 | Remember |
| 12 | Explain wheel alignment basics. | 2 | Understand |
| 13 | Define steering linkage service. | 1 | Remember |
| 14 | Describe steering column maintenance. | 2 | Understand |
| 15 | What is rack and pinion steering? | 1 | Remember |
| 16 | List brake system checks. | 1 | Remember |
| 17 | Explain ABS fault diagnosis. | 2 | Understand |
| 18 | State tyre pressure monitoring. | 1 | Remember |
| 19 | Describe strut servicing tools. | 2 | Understand |
| 20 | Define alignment specifications. | 1 | Remember |
| 21 | Explain clutch free play adjustment. | 2 | Understand |
| 22 | List hydraulic brake bleeding types. | 1 | Remember |
| 23 | Describe tyre rotation patterns. | 2 | Understand |
| 24 | State balancing machine functions. | 1 | Remember |
| 25 | Define steering gear maintenance. | 1 | Remember |

| PART B (16 MARKS) | | | |
|--------------------------|--|---|-------------------|
| 1 | (a) Explain clutch adjustment and service procedures with diagrams. (b) Describe hydraulic brake maintenance and bleeding process . | 3 | Understand |
| 2 | With sketches, explain ABS system checking and component servicing . | 4 | Analyze |
| 3 | (a) Discuss McPherson strut and coil spring maintenance procedures . (b) Explain tyre wear measurement, tread depth, and rotation practices . | 3 | Understand |
| 4 | Elaborate on computerized wheel balancing and wheel alignment procedures . (16) | 3 | Apply |
| 5 | Explain steering linkage, steering column, and rack & pinion maintenance . (16) | 3 | Apply |
| 6 | Analyze brake system interactions with ABS and hydraulic components . (16) | 4 | Analyze |
| 7 | Design a comprehensive vehicle suspension service protocol . (16) | 3 | Apply |
| 8 | Compare tyre rotation strategies and their impact on vehicle longevity . (16) | 4 | Analyze |
| 9 | Evaluate steering system maintenance impact on vehicle handling and safety . (16) | 5 | Evaluate |
| 10 | Explain clutch service procedures and wear pattern analysis . (16) | 4 | Analyze |
| 11 | Design ABS component service and brake bleeding maintenance plan . (16) | 3 | Apply |
| 12 | Analyze McPherson strut repairs and coil spring replacement techniques . (16) | 4 | Analyze |
| 13 | Discuss wheel alignment specifications and balancing machine operations . (16) | 3 | Apply |
| 14 | Evaluate hydraulic brake maintenance effectiveness and safety benefits . (16) | 5 | Evaluate |
| 15 | Design complete vehicle alignment and tyre maintenance schedule . (16) | 3 | Apply |
| 16 | Compare different ABS system components across vehicle models. (16) | 4 | Analyze |
| 17 | Explain strut servicing procedures with practical repair scenarios. (16) | 3 | Apply |
| 18 | Analyze wheel balancing data interpretation and alignment effects . (16) | 4 | Analyze |

UNIT – IV VEHICLE SAFETY

Concepts of vehicle safety -Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, air bags, electronic system for activating air bags, bumper design for safety, Active Safety - ABS, EBD, CSC, Traction control system, Modern electronic features in vehicles like tyre pressure monitoring, Automatic headlamp ON, Rain sensing wipers.

PART A (2 Marks)

| | | | |
|----|---|---|-------------------|
| 1 | Define vehicle safety concepts. | 1 | Remember |
| 2 | List seat belt regulations. | 1 | Remember |
| 3 | Explain automatic seat belt tighteners. | 2 | Understand |
| 4 | Describe collapsible steering column. | 2 | Understand |
| 5 | What are air bag activation systems? | 1 | Remember |
| 6 | State bumper design for safety. | 1 | Remember |
| 7 | Define Active Safety systems. | 1 | Remember |
| 8 | Explain ABS functions. | 2 | Understand |
| 9 | Describe EBD operations. | 2 | Understand |
| 10 | What is CSC in vehicles? | 1 | Remember |
| 11 | List traction control features. | 1 | Remember |
| 12 | Explain tyre pressure monitoring. | 2 | Understand |
| 13 | Describe automatic headlamp ON. | 2 | Understand |
| 14 | What are rain sensing wipers? | 1 | Remember |
| 15 | List passive safety elements. | 1 | Remember |
| 16 | Explain air bag electronics. | 2 | Understand |
| 17 | State seat belt types. | 1 | Remember |
| 18 | Define EBD benefits. | 1 | Remember |
| 19 | Describe CSC applications. | 2 | Understand |
| 20 | List modern safety electronics. | 1 | Remember |
| 21 | Explain traction control logic. | 2 | Understand |
| 22 | Describe TPMS alerts. | 2 | Understand |
| 23 | State headlamp auto features. | 1 | Remember |
| 24 | Define wiper sensor technology. | 1 | Remember |
| 25 | List bumper impact absorption. | 1 | Remember |

| PART B (16 MARKS) | | | |
|--------------------------|--|---|-------------------|
| 1 | (a) Explain vehicle safety concepts and seat belt regulations. (8) (b) Describe airbag systems and electronic activation. (8) | 3 | Apply |
| 2 | With diagrams, explain Active Safety systems – ABS, EBD, Traction Control. (16) | 3 | Apply |
| 3 | (a) Discuss collapsible steering column and bumper safety design. (8) (b) Explain modern electronic safety features such as TPMS, auto headlamps. (8) | 3 | Understand |
| 4 | Elaborate on passive safety systems and automatic seat belt mechanisms. (16) | 3 | Apply |
| 5 | Analyze active vs passive safety systems with comparative evaluation. (16) | 4 | Analyze |
| 6 | Design vehicle safety regulation compliance and feature integration plan. (16) | 3 | Apply |
| 7 | Evaluate ABS, EBD, and traction control system integration effectiveness. (16) | 5 | Evaluate |
| 8 | Explain TPMS and rain sensing wiper technologies with applications. (16) | 3 | Apply |
| 9 | Analyze collapsible steering column deformation behavior in crashes. (16) | 4 | Analyze |
| 10 | Compare airbag electronic trigger systems and deployment mechanisms. (16) | 4 | Analyze |
| 11 | Design comprehensive vehicle safety features diagnostic checklist (16) | 3 | Apply |
| 12 | Evaluate modern electronic safety aids impact on accident prevention. (16) | 5 | Evaluate |
| 13 | Explain traction control operation in slippery road conditions. (16) | 3 | Apply |
| 14 | Compare ABS performance with EBD in different braking scenarios. (16) | 4 | Analyze |
| 15 | Design bumper impact absorption and crash safety features. (16) | 3 | Apply |
| 16 | Analyze TPMS data interpretation for tyre maintenance safety.(16) | 4 | Analyze |
| 17 | Evaluate CSC vs traction control system effectiveness. (16) | 5 | Evaluate |
| 18 | Explain auto headlamp and rain sensing wiper system integration. (16) | 3 | Apply |

UNIT – V SIMULATION OF SAFETY CONCEPTS

Active safety: driving safety, conditional safety, perceptibility safety, operating safety passive safety: exterior safety, interior safety, deformation behavior of vehicle body, speed and acceleration characteristics of passenger compartment on impact. Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system Interactions.

PART A (2 Marks)

| | | | |
|----|------------------------------------|---|------------|
| 1 | Define active safety types. | 1 | Remember |
| 2 | List driving safety elements. | 1 | Remember |
| 3 | Explain conditional safety. | 2 | Understand |
| 4 | Describe perceptibility safety. | 2 | Understand |
| 5 | What is operating safety? | 1 | Remember |
| 6 | State passive safety basics. | 1 | Remember |
| 7 | Define exterior safety features. | 1 | Remember |
| 8 | Explain interior safety. | 2 | Understand |
| 9 | Describe vehicle body deformation. | 2 | Understand |
| 10 | List impact speed characteristics. | 1 | Remember |
| 11 | What is collision warning system? | 1 | Remember |
| 12 | Explain rear-end collision causes. | 2 | Understand |
| 13 | Describe frontal object detection. | 2 | Understand |
| 14 | State rear vehicle detection. | 1 | Remember |
| 15 | Define braking object detection. | 1 | Remember |
| 16 | List safety simulation objectives. | 1 | Remember |
| 17 | Explain compartment acceleration. | 2 | Understand |
| 18 | Describe deformation behavior. | 2 | Understand |
| 19 | State warning system components. | 1 | Remember |
| 20 | Define conditional safety factors. | 1 | Remember |
| 21 | Explain perceptibility aids. | 2 | Understand |
| 22 | List passive exterior protections. | 1 | Remember |
| 23 | Describe interior padding roles. | 2 | Understand |
| 24 | State impact passenger dynamics. | 1 | Remember |
| 25 | Define frontal detection sensors. | 1 | Remember |

PART B (15 MARKS)

| | | | |
|----|--|--------|------------------|
| 1 | (a) Classify active safety types with examples. (8) (b) Explain passive safety – exterior and interior features. (8) | 3 3 | Apply Apply |
| 2 | With diagrams, explain collision warning systems and object detection . (16) | 3 | Apply |
| 3 | (a) Discuss vehicle body deformation behavior in impacts. (8) (b) Explain passenger compartment speed characteristics . (8) | 3 4 | Apply Analyze |
| 4 | Elaborate on rear-end collision causes and frontal object detection systems . (16) | 3 | Apply |
| 5 | Analyze active safety categories – driving, conditional, perceptibility safety. (16) | 4 | Analyze |
| 6 | Design vehicle safety simulation covering deformation and impact analysis . (16) | 3 | Apply |
| 7 | Evaluate active vs passive safety simulation effectiveness . (16) | 5 | Evaluate |
| 8 | Explain object detection systems with braking interactions . (16) | 3 | Apply |
| 9 | Analyze conditional safety and operating safety simulation parameters . (16) | 4 | Analyze |
| 10 | Compare frontal vs rear vehicle detection systems performance. (16) | 4 | Analyze |
| 11 | Design interior/exterior passive safety feature optimization . (16) | 3 | Apply |
| 12 | Evaluate vehicle body structure crash performance simulations . (16) | 5 | Evaluate |
| 13 | Explain collision warning system components and effectiveness analysis . (16) | 4 | Analyze |
| 14 | Design comprehensive safety concept simulation protocol . (16) | 3 | Apply |
| 15 | Analyze passenger compartment dynamics during impacts . (16) | 4 | Analyze |
| 16 | Compare different active safety categories implementation . (16) | 4 | Analyze |
| 17 | Design rear collision mitigation system with simulations. (16) | 3 | Apply |
| 18 | Evaluate safety simulation outcomes for deformation behavior . (16) | 5 | Evaluate |