

**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024**

Fifth Semester

**Mechanical Engineering**

**20MEPC501 - AUTOMOTIVE SYSTEMS**

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

- |  | <i>Marks</i> | <i>K-<br/>Level</i> | <i>CO</i> |
|--|--------------|---------------------|-----------|
| 1. Which of the followings is considered as the skeleton of the vehicle?<br>(a) Body                      (b) Chassis                      (c) Frame                      (d) Wheels   | 1            | K1                  | CO1       |
| 2. The volume contained in the cylinder above the top of the piston when the piston is at top dead center is called _____.<br>(a) Total volume      (b) Swept volume      (c) Stroke volume      (d) Clearance volume                        | 1            | K1                  | CO1       |
| 3. The drive to the ignition system of the engine is provided by<br>(a) camshaft      (b) crankshaft      (c) flywheel      (d) connecting rod   | 1            | K2                  | CO1       |
| 4. Automotive capacitors are in the vicinity of _____ to _____ microfarads.<br>(a) 0.2 to 0.3      (b) 0.1 to 0.2      (c) 0.3 to 0.4      (d) 0.5 to 0.6  | 1            | K1                  | CO2       |
| 5. Which of the following generates the pulses to operate the solenoid controlled spill valve in electronically controlled gasoline injection system?<br>(a) Engine      (b) Camshaft      (c) Electronic Control Unit      (d) Turbocharger | 1            | K1                  | CO2       |
| 6. The range of pressure pressurized by the fuel injection pump before the injector in the diesel engine is _____.<br>(a) 600 to 1000 bar      (b) 1 to 10 bar      (c) 10 to 100 bar      (d) 10 to 20 bar                                  | 1            | K1                  | CO2       |
| 7. Which types of gears are used in constant mesh gearbox?<br>(a) Spur gear      (b) Helical gear      (c) Bevel gear      (d) Worm gear   | 1            | K1                  | CO3       |
| 8. What is the need of the universal joint in an automobile?<br>(a) To change inclination      (b) To bend sideways<br>(c) To transfer torque at an angle      (d) To change length  | 1            | K2                  | CO3       |
| 9. The clutch is located in an automobile _____.<br>(a) Between transmission and engine      (b) Between transmission and rear axle<br>(c) Between transmission and propeller shaft      (d) Between transmission and differential           | 1            | K2                  | CO3       |
| 10. If the front of the front wheels is inside and rear of front wheels are apart when the vehicle is at rest, then the configuration is called _____.<br>(a) Toe-in      (b) Toe out      (c) Positive camber      (d) Positive castor      | 1            | K1                  | CO4       |
| 11. In the steering gear, a gear sector or toothed roller is meshed with a _____.<br>(a) ball bearing      (b) roller bearing      (c) worm      (d) steering wheel  | 1            | K1                  | CO4       |
| 12. In traction, the front wheel acts as _____.<br>(a) drive wheel      (b) caster wheel      (c) steered wheel      (d) track wheel   | 1            | K1                  | CO4       |
| 13. A fuel cell is a/an _____ device.<br>(a) electrical      (b) electrochemical      (c) chemical      (d) mechanical   | 1            | K2                  | CO5       |
| 14. What is the main problem in using hydrogen as fuel for vehicles?<br>(a) Capital intensive      (b) Storage<br>(c) Fuel cell technology is not well established      (d) Cars will become heavy   | 1            | K2                  | CO5       |
| 15. Which is an optimum blend to use biodiesel as fuel in a diesel engine?<br>(a) B10      (b) B5      (c) B50      (d) B20  | 1            | K2                  | CO5       |
| 16. Major gas present in the composition of natural gas is _____.<br>(a) Methane      (b) Ethane      (c) Propane      (d) Iso-butane  | 1            | K1                  | CO5       |

17. Two-way catalytic converter is used to control \_\_\_\_\_ and \_\_\_\_\_ in the emission of engines. 1 K1 CO6  
 (a) HC, NO<sub>x</sub>                      (b) CO, NO<sub>x</sub>                      (c) HC, CO                      (d) CO<sub>2</sub>, HC
18. What of the followings is a limitation of turbocharger? 1 K2 CO6  
 (a) Turbo temperature              (b) Hot air                      (c) Turbo drop                      (d) Throttle lag
19. A wastegate turbocharger is better for \_\_\_\_\_ applications. 1 K2 CO6  
 (a) high power                      (b) low                      (c) medium                      (d) low to medium
20. As per BS VI norms, the permissible value of particulate matter (PM) in the emission of diesel engine is 1 K1 CO6  
 (a) 20–40 micrograms per cubic meter                      (b) 10–20 micrograms per cubic meter  
 (c) 5–10 micrograms per cubic meter                      (d) 40–50 micrograms per cubic meter

**PART - B (10 × 2 = 20 Marks)**

Answer ALL Questions

21. Classify the automobiles based on (i) driving axle and (ii) body style. 2 K2 CO1
22. Describe the functions of the piston in the I.C. engine. 2 K1 CO1
23. List the major components of electronic controlled gasoline injection system. 2 K1 CO2
24. Give the limitations of unit injector system of diesel engine. 2 K1 CO2
25. Identify the need of overdrive gear in automobile. 2 K2 CO3
26. List the specific purpose of Hotchkiss drive. 2 K1 CO3
27. Describe the significance of positive castor angle in the automobile. 2 K1 CO4
28. Express the causes of poor brakes. 2 K2 CO4
29. Justify how a hybrid electric vehicle is a pollution free vehicle. 2 K2 CO5
30. Summarize the main pollutants from diesel engine. 2 K2 CO6

**PART - C (6 × 10 = 60 Marks)**

Answer ALL Questions

31. a) Explain the general chassis construction with the help of suitable diagram. 10 K2 CO1  
**OR**
- b) Discuss in detail the technology of variable valve timing diagram of the engine in use. 10 K2 CO1
32. a) Demonstrate the Common Rail Direct Ignition (CRDI) system with its advantages. 10 K2 CO2  
**OR**
- b) Compare the various parameters of the transistorized coil ignition system and capacitor discharge ignition system of petrol engine. 10 K2 CO2
33. a) Explain the construction and operation of centrifugal clutch with the relevant sketches. 10 K2 CO3  
**OR**
- b) Illustrate the construction and working of a differential unit of automobile with a neat sketch. 10 K2 CO3
34. a) Compare the advantages and disadvantages of independent suspension over rigid axle type suspension of automobile. 10 K2 CO4  
**OR**
- b) Explain the need and functioning of Antilock Braking System (ABS) with a neat sketch. 10 K2 CO4

35. a) Draw and explain the operation of LPG fuelled system. 10 K2 CO5
- OR**
- b) i) Discuss the properties of hydrogen. 5 K2 CO5  
ii) What are the merits and demerits of hydrogen fuel? 5 K2 CO5
36. a) Explain briefly the main types of supercharging methods. 10 K2 CO6
- OR**
- b) Explain the working of three-way catalytic converter with a neat sketch. 10 K2 CO6