SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203.

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

V SEMESTER

ME3562 MOBILITY ENGINEERING

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Prepared by

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UNIT-I VEHICLE STRUCTURE AND ENGINES

Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions and materials, variable valve timing (VVT).

PART-A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	Define an Automobile.	BT-1	Remembering
2.	How automobile is classified on the basis of type of wheel drive?	BT-2	Understanding
3.	List out the main components of automobiles.	BT-2	Understanding
4.	Difference between Diesel engine and Petrol engine.	BT-2	Understanding
5.	How crankshafts usually made?	BT-2	Understanding
6.	Define chassis, frame, body and suspension.	BT-1	Remembering
7.	List out the functions of a frame.	BT-1	Remembering
8.	Identify the types of sections used to make the frames.	BT-1	Remembering
9.	List of the forces acting on a chassis frame.	BT-1	Remembering
10.	What are the advantages of diesel engines in cars?	BT-1	Remembering
11.	What is chassis? How its design is related to vehicle aerodynamics?	BT-2	Understanding
12.	Why petrol engines are preferred for two wheelers?	BT-2	Understanding
13.	State the advantage of Uni body construction over Body on frame.	BT-2	Understanding
14.	Why are rings provided on piston?	BT-1	Remembering
15.	List out the methods of cooling in IC engines.	BT- 1	Remembering
16.	What is meant by lubrication?	BT-1	Remembering
17.	State the requirements of bodies for various types of vehicles.	BT-1	Remembering

18.	What is the material used for construction of piston and piston-ring?	BT-1	Remembering
19.	What is referred as variable valve timing?	BT-1	Remembering
20.	Point out the different methods of variable valve timing.	BT-1	Remembering
21.	Sate the difference between carburetor and fuel injector	BT-2	Understanding
22.	What is the need for gearbox in an automobile?	BT-2	Understanding
23.	State the factors that affect the rolling resistance of a vehicle.	BT-1	Remembering
24.	Name the different kind of resistances to vehicle motion.	BT-2	Understanding
25.	Differentiate between Coupe and Sedan car body types.	BT-2	Understanding

	PART-B (16 Marks)			
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1	Discuss the factors that affect the resistances to vehicle motion.	16	BT-1	Remembering
2	What are the main components of an automobile? Describe all of them briefly.	16	BT-2	Understanding
3	Explain integral and semi-integral type vehicle body construction.	16	BT-2	Understanding
4	Draw the layout of four-wheel drive and list its advantages and disadvantages.	16	BT-2	Understanding
5	Explain briefly the various types of chassis construction with the help of suitable diagram.	16	BT-2	Understanding
6	Explain briefly about vehicle aerodynamics.	16	BT-2	Understanding
7	Explain with suitable sketches: valve timing diagrams for Otto and Diesel engines.	16	BT-2	Understanding
8	a) Write short notes about sub frames and defect in frames.	8	BT-2	Understanding
	b) Draw and explain about frameless construction.	8	BT-2	Understanding
9	Draw schematic diagrams showing the layout of the transmission system of a rear wheel driven car and also of a four wheel drive vehicle.	16	BT-2	Understanding
10	a) What are the normal frame defects?	8	BT-2	Understanding
	b) List the various requirements of automobile body.	8	BT-2	Understanding

11	What is meant by variable valve timing? Discuss on the technologies in use.	16	BT-1	Remembering
12	Compare Spark Ignition engine and Compression Ignition engine.	16	BT-2	Understanding
13	Explain about all wheel drive with suitable sketch	16	BT-2	Understanding
14	Draw a neat diagram of an IC engine and explain some important parts.	16	BT-2	Understanding
15	Explain the construction of various frames used in automobiles with neat sketch.	16	BT-2	Understanding
16	Explain vehicle experiences different resistance in its motion.	16	BT-2	Understanding
17	List the engine parts with their functions, materials and method of its manufacture with neat sketch.	16	BT-2	Understanding
18	Draw a simple sketch of a solid frame with front engine and rear drive. Locate major components of the engine on the frame.	16	BT-2	Understanding

UNIT-II ENGINE AUXILIARY SYSTEMS

Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

PART-A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	What is Gasoline direct injection?	BT-2	Understanding
2.	Define common rail direct injection system.	BT-2	Understanding
3.	Summarize the function of fuel supply system.	BT-2	Understanding
4.	Define electronic ignition system.	BT-2	Understanding
5.	Write the functions of Turbo chargers.	BT-2	Understanding
6.	List out the advantages of petrol injection.	BT-1	Remembering
7.	Define super charging.	BT-2	Understanding
8.	What is meant by carburetion in IC engine?	BT-1	Remembering
9.	List out the components of Multi point fuel injection system.	BT-1	Remembering
10.	State the advantages of electronic ignition system using contact breaker.	BT-2	Understanding
11.	Summarize the main pollutants from diesel engine.	BT-2	Understanding
12.	Why the engine emissions to be controlled?	BT-2	Understanding
13.	Name four major parts that forms as exhaust system in an automobile system.	BT-2	Understanding
14.	Mention the methods controlling smoke from diesel engine.	BT-2	Understanding
15.	What is known as smog in an automobile?	BT-2	Understanding
16.	Express the methods to clean the exhaust gas.	BT-2	Understanding
17.	Write the purpose of catalytic converter.	BT-1	Remembering
18.	Point out the basic requirements of a catalytic converter.	BT-1	Remembering
19.	What happens in a catalytic converter?	BT-2	Understanding
20.	What is known as ‘EURO NORMS’?	BT-1	Remembering
21.	Why do we need to use superchargers in engines?	BT-2	Understanding

22.	State the difference between turbocharger and supercharger.	BT-1	Remembering
23.	Differentiate between battery and magneto ignition system.	BT-1	Remembering
24.	What is the sequence of operation in unit injector?	BT-1	Remembering
25.	What is main purpose of fuel injection system in CI engine?	BT-1	Remembering

	PART-B (16 Marks)			
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1	List the various parts of the fuel feed system of a car and draw a line diagram showing these parts in respective position.	16	BT-1	Remembering
2	Sketch and explain the construction and operation of a simple carburettor.	16	BT-2	Understanding
3	Illustrate with a sketch the working of a Unit injector system.	16	BT-3	Applying
4	Explain in detail the working of rotary distribution type fuel injection system.	16	BT-2	Understanding
5	What is Common Rail Direct Ignition (CRDI) system and explain with a suitable sketch and write its advantages and disadvantages of CRDI?	16	BT-3	Applying
6	Explain with a suitable sketch the working of a Transistorized Coil Ignition (TCI) system and write its advantages and disadvantages of the TCI system.	16	BT-5	Evaluating
7	Explain with a suitable sketch the working of a Capacitor Discharge Ignition (CDI) system and write its advantages and disadvantages of the CDI system?	16	BT-2	Understanding
8	Explain the working of variable geometry turbocharger (VGT), with a neat sketch.	16	BT-2	Understanding
9	Explain the working of Waste gate turbocharger (WGT), with a neat sketch.	16	BT-2	Understanding
10	a) Write short notes on air pollution and its pollutants.	8	BT-2	Understanding
	b) How air pollution can be controlled?	8	BT-2	Understanding
11	Explain about the Engine emission control by three way catalytic converter system.	16	BT-1	Remembering
12	Discuss on exhaust emission control from automobiles.	16	BT-2	Understanding
13	What is EGR? Explain the system with suitable sketch?	16	BT-2	Understanding

14	What are the major pollutants in exhaust gases from automobile? Discuss in EURO III and EURO IV.	16	BT-2	Understanding
15	With a neat sketch explain the electronically controlled gasoline injection system for SI engine.	16	BT-2	Understanding
16	How electronically controlled unit diesel injector system function?	16	BT-2	Understanding
17	Explain engine emission control by three-way catalytic converter system.	16	BT-2	Understanding
18	Explain the construction and working of Turbocharger with a neat sketch.	16	BT-2	Understanding

UNIT-III TRANSMISSION SYSTEMS

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

PART-A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	List out the various components in transmission system.	BT-1	Remembering
2.	Express the functions of transmission system.	BT-1	Remembering
3.	Define clutch.	BT-2	Understanding
4.	What are the types of clutch?	BT-2	Understanding
5.	State the requirements of an automotive clutch.	BT-2	Understanding
6.	Identify the need of gear box in automobile.	BT-1	Remembering
7.	Define tractive effort.	BT-2	Understanding
8.	What is an over drive?	BT-1	Remembering
9.	What is a universal joint and write its types?	BT-1	Remembering
10.	Express the clutch slippage.	BT-2	Understanding
11.	Define cone clutch.	BT-3	Applying
12.	List out the advantages of diaphragm clutch.	BT-3	Applying
13.	How is reverse gear obtained in the normal type of gear box?	BT-2	Understanding
14.	What is the principle of a “synchromesh” gear box?	BT-5	Evaluating
15.	Summarize the function of the free wheel in over drive.	BT-2	Understanding
16.	List out the various universal joints in use.	BT-2	Understanding
17.	What is trunion?	BT-1	Remembering
18.	Identify the specific purpose of Hotchkiss and torque tube drive.	BT-1	Remembering
19.	What will happen if differential is not used?	BT-2	Understanding
20.	List out the functions of front axle.	BT-1	Remembering

21.	State the forces act on the rear axle.	BT-2	Understanding
22.	What is the use of torque convertor?	BT-2	Understanding
23.	What is the function of a propeller shaft?	BT-2	Understanding
24.	State the functions of slip joint.	BT-2	Understanding
25.	What is a fluid coupling?	BT-2	Understanding

	PART-B (16 Marks)			
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1	Explain clearly the necessity of a transmission in a vehicle.	16	BT-1	Remembering
2	Describe the working of a "single plate clutch" with a neat sketch and write its advantages and disadvantages.	16	BT-2	Understanding
3	Describe the construction and working of the following: • Cone clutch • Multi plate clutch	16	BT-3	Applying
4	Describe the following clutch operation with a neat sketch • Mechanical operation clutches • Vacuum operated clutch	16	BT-2	Understanding
5	With the help of a neat sketch, explain the construction and operation of a sliding mesh gearbox.	16	BT-3	Applying
6	With the help of a neat sketch, explain the construction and operation of a constant mesh gearbox.	16	BT-3	Applying
7	Briefly describe the construction and working of a fluid coupling.	16	BT-2	Understanding
8	a) Write overdrive troubles and their causes.	8	BT-3	Applying
	b) Comparison between the fluid fly wheel and torque converter.	8	BT-2	Understanding
9	Explain the construction and working principle of propeller shaft.	16	BT-5	Evaluating
10	Explain the construction and working of a differential with a neat sketch	16	BT-2	Understanding
11	What is universal joint? And explain the different types of universal joints with a neat sketch.	16	BT-1	Remembering

12	What is a CVT? Describe? Describe its principle of working in detail with the help of simple diagrams; discuss also its main advantages and limitations.	15	BT-1	Remembering
13	Explain briefly, with neat sketches of the following: • Torque tube drive • Hotchkiss drive	8 8	BT-2	Understanding
14	Explain the Half floating rear axle with neat sketches.	16	BT-2	Understanding
15	Explain the semi centrifugal clutch with neat sketch.	16	BT-2	Understanding
16	Explain the Fully floating rear axle with neat sketches.	16	BT-2	Understanding
17	Explain the Three-quarter floating rear axle with neat sketches.	16	BT-2	Understanding
18	Explain the working principle of hotch kiss drive with neat sketch.	16	BT-2	Understanding

UNIT-IV STEERING, BRAKES AND SUSPENSION SYSTEMS

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

PART-A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	What is meant by centre point steering?	BT-2	Understanding
2.	Why is camber angle provided?	BT-2	Understanding
3.	Express the purpose of steering linkage.	BT-2	Understanding
4.	Define power steering.	BT-2	Understanding
5.	List out the function of a braking system.	BT-2	Understanding
6.	Identify the functions of brake lining.	BT-1	Remembering
7.	List out the advantages of disc brake.	BT-2	Understanding
8.	What is pitching in the suspension system?	BT-1	Remembering
9.	Define wishbone.	BT-1	Remembering
10.	Express the causes of poor brakes.	BT-2	Understanding
11.	Point out the functions of break shoe.	BT-3	Applying
12.	What do you mean by “Independent suspension”?	BT-3	Applying
13.	What is bouncing in the suspension system?	BT-2	Understanding
14.	How are leaf spring lubricated?	BT-1	Remembering
15.	How is shock absorber fitted in the vehicle?	BT-2	Understanding
16.	List out the functions of the shock absorber.	BT-1	Remembering
17.	What is a slave cylinder?	BT-1	Remembering
18.	Point out the main parts of the air braking system.	BT-1	Remembering
19.	Summarize about anti-lock system in brakes.	BT-1	Remembering
20.	Mention the benefits of anti-lock brake system.	BT-1	Remembering

21.	Define caster and camber.	BT-1	Remembering
22.	Define king pin inclination.	BT-1	Remembering
23.	What is the purpose of Toe -in and Toe-out?	BT-1	Remembering
24.	What is meant by bleeding of brakes?	BT-1	Remembering
25.	What do you understand by Traction control?	BT-1	Remembering

	PART-B (16 Marks)			
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1	Sketch and explain the layout of steering system.	16	BT-1	Remembering
2	Explain the Ackermann steering mechanism and Davis steering mechanism with a neat sketch.	16	BT-2	Understanding
3	Define and explain the following front wheel alignment factors: • Camber • Caster • King-pin inclination	16	BT-3	Applying
4	Describe the construction and operation of power steering.	16	BT-2	Understanding
5	What is front axle? Write its functions and explain the types of front axles.	16	BT-3	Applying
6	Explain the construction and working of mechanical brakes with a neat sketch.	16	BT-5	Evaluating
7	What is anti-lock braking system and explain the need and functioning of ABS with a neat sketch.	16	BT-2	Understanding
8	Write the principle of Braking and co efficient of friction.	16	BT-3	Applying
	Describe the following: • Stopping distance • Braking performance • Braking efficiency.	16	BT-2	Understanding
9	Explain hydraulic brake with a neat sketch and write its advantages.	16	BT-2	Understanding
10	a) What is the necessity of a braking system?	8	BT-2	Understanding
	b) Explain the function of master cylinder in hydraulic brakes?	8	BT-4	Analyzing

11	Sketch and explain the working of telescopic hydraulic shock absorber and point out the effect does their action have on the working of springs?	16	BT-1	Remembering
12	Explain the functions of rear wheel suspension system.	16	BT-1	Remembering
13	State the advantages and disadvantages of independent suspension over rigid axle type suspension.	16	BT-2	Understanding
14	Describe the Macpherson strut assembly of independent suspension system with a neat sketch.	16	BT-2	Understanding
15	Explain the working of rear independent suspension system with neat sketch.	16	BT-2	Understanding
16	Explain with the help of simple diagram the different types of stub axles.	16	BT-2	Understanding
17	What are the objectives and components of suspension system?	16	BT-2	Understanding
18	Explain the steering geometry with neat sketch.	16	BT-2	Understanding

UNIT-V ALTERNATIVE ENERGY SOURCES

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Electric and Hybrid Vehicles, Fuel Cell.

PART-A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	What is CNG and how is it used in automobiles?	BTL-1	Remembering
2.	Define LPG and its chemical composition.	BTL-2	Understanding
3.	What is Biodiesel made from?	BTL-1	Remembering
4.	Mention any two advantages of using Hydrogen as a fuel.	BTL-2	Understanding
5.	What is Gasohol?	BTL-1	Remembering
6.	What is bioethanol?	BTL-1	Remembering
7.	What is the composition of natural gas	BTL-1	Remembering
8.	Mention any one advantage of using CNG.	BTL-2	Understanding
9.	What are the different alternative fuels suitable for automobiles?	BTL-1	Remembering
10.	List down the properties of alternate fuels.	BTL-1	Remembering
11.	State one benefit of using biodiesel.	BTL-2	Understanding
12.	Mention any four types of fuel cell.	BTL-1	Remembering
13.	What are the advantages of using compressed natural gas	BTL-1	Remembering
14.	Give any four advantages of biodiesel.	BTL-1	Remembering
15.	Differentiate between bio-fuel and bio-diesel.	BTL-1	Remembering
16.	What are the advantages and limitations of alcohols as engine fuel?	BTL-1	Remembering
17.	Compare the properties of alcohols and gasoline as engine fuels	BTL-2	Understanding
18.	Why is hydrogen called as secondary energy source?	BTL-1	Remembering
19.	What are the methods for using hydrogen	BTL-1	Remembering
20.	Enumerate the limitations of electric vehicle.	BTL-1	Remembering
21.	What is fuel cell?	BTL-1	Remembering
22.	State one difference between fuel cell vehicles and battery EVs.	BTL-4	Analyze
23.	Define a hybrid vehicle.	BTL-1	Remembering
24.	Mention the classification of Hybrid vehicles?	BTL-1	Remembering
25.	What are the components of a hybrid vehicle	BTL-1	Remembering

PART- B (16-MARKS)			
Q.No	**Questions**	**BT Level**	**Competence**
1	Describe the properties, advantages, and limitations of Compressed Natural Gas (CNG) as an automotive fuel	BT-2	Understanding
2	Explain the working, components, and conversion process of a petrol engine to run on Liquefied Petroleum Gas	BT-2	Understanding
3	Explain the reasons for looking for alternate fuels for IC engines	BT-3	Applying
4	Draw and explain the operation of liquefied petroleum gas system	BT-1	Remembering
5	Compare the emission characteristics of CNG and LPG with conventional gasoline fuels	BT-5	Evaluating
6	Compare bio-diesel with diesel engine in Performance, Combustion and Emission Characteristics.	BT-5	Evaluating
7	Illustrate with neat diagrams the layout and operation of a dual-fuel CNG-gasoline engine	BT-2	Understanding
8	Combustion and Emission Characteristics of CI engines with these alternate fuels	BT-5	Evaluating
9	Explain in detail about the electrical vehicle system with a block diagram	BT-5	Evaluating
10	With a layout diagram, explain the working features of hybrid vehicles	BT-2	Understanding
11	Discuss the salient properties of hydrogen as a fuel and explain the methods to use hydrogen as fuel in automobile	BT-5	Evaluating
12	Explain fuel cell with a neat sketch. Give their disadvantages and advantages	BT-4	Analyzing
13	Explain the construction and working of the PEM fuel cell with sketch	BT-2	Understanding
14	Evaluate the environmental and performance impacts of using LPG in automobiles.	BT-4	Analyzing
15	Explain the construction, working, types, and applications of Fuel Cells in automobiles	BT-2	Understanding
16	(i) Write short notes on: (i) Bio-ethanol production, (ii) Hydrogen Fuel Cell Vehicle (FCV) working principle.	BT-2	Understanding

17	Analyze the working principle and electrochemical reactions involved in Proton Exchange Membrane Fuel Cells (PEMFC) used in automobiles	BT-4	Analyzing
18	Evaluate the suitability of Bio-diesel as a long-term replacement for petroleum diesel	BT-5	Evaluating