

**Monad University, Hapur**

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**Subject Name: Automobile Engineering**

### **Automobile Engineering**

#### **Introduction:-**

Automobile engineering is one of the branches of mechanical engineering. In automobile engineering we study about various types of vehicles which are used to transport passengers, goods, etc. Basically all types of vehicles driven by internal combustion engines and motion is transmitted through a transmission system. In automobile engineering, we also study about mechanisms and working principles of transmission systems of automobiles. After the study of these components, we can understand how the automobile works.

#### **Classification of automobile:-**

Automobiles can be classified on different bases as given below:-

1. On the basis of wheels:

- (a) Two-wheeler vehicle (for example: scooter, motorcycle, scooty)
- (b) Three-wheeler vehicle (for example: auto rickshaw, three-wheeler scooter and tempo, etc)
- (c) Four-wheeler vehicle (for example: car, jeep, trucks, buses, etc.)
- (d) Six-wheeler vehicle (for example: big truck having six wheels)

2. On the basis of fuel used:

- (a) Petrol vehicle (for example: cars, motorcycle, scooter, etc.)
- (b) Diesel vehicle (for example: buses, trucks, etc.)
- (c) Electric vehicle (for example: e-rickshaw on Indian roads)
- (d) Gas vehicle (for example: LPG & CNG vehicle)

3. On the basis of load:-

- (a) Heavy transport vehicle ( for example: truck, buses etc.)
- (b) Light transport vehicle ( for example: pickup)
- (c) Light motor vehicle ( for example: cars, jeeps, etc.)

4. Position of engine:-

- (a) Engine in front: Mostly in warm climate country vehicles are used having engine in the front.
- (b) Engine in the rear side: Mostly in cold country vehicles are used having engine in rear side.

5. On the basis of mode of transmission system:-

- (a) Conventional vehicle with manual transmission, e.g. car with 5 gears.
- (b) Semi-automatic
- (c) Automatic: In automatic transmission gears are changed automatically as per speed of the vehicle.

6. On the basis of drive:-

- (a) Left hand drive
- (b) Right hand drive

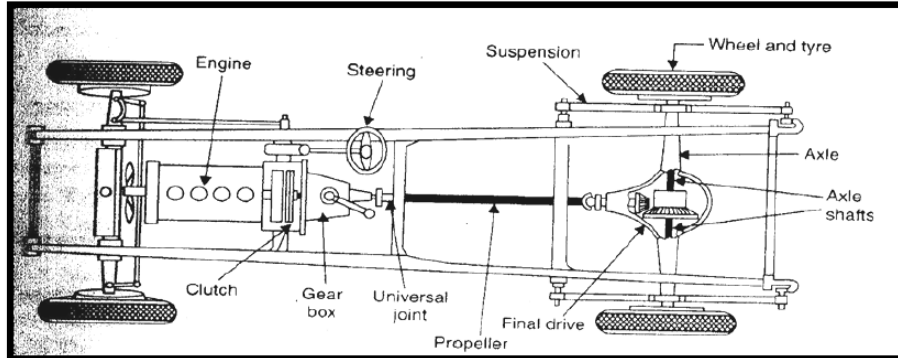
7. On the basis of driving axle:-

- (a) Front wheel drive
- (b) Rear wheel drive
- (c) All wheel drive

## Layout of an automobile chassis:-

### 1.4 LAYOUT OF AN AUTOMOBILE CHASIS

Layout of an engine chassis is shown below :



It contains the source of power, i.e. engine, the frame, which supports the engine,

transmission system, braking system, steering system, wheel and body of vehicle.

### Components of the automobile:-

There are five main components of an automobile:-

- (a) The frame:- The frame is made of tubular and channel member which are joint with the help of welding or riveted. It is main skeleton of the vehicle.
- (b) Chassis:- If the main components are mounted on the frame, then it is called chassis.
- (c) Body of the automobile which is fitted on the chassis
- (d) The engine or power plant: It is basically an internal combustion engine in which combustion of fuel take place.
- (e) The transmission system:- It consists of clutch, gears system, shaft, axles and differential.

### Functions of main components of an automobile:-

Engine or power plant:

Engine is called as a power plant of the automobile because it gives the main power for the running of an automobile. In automobile internal combustion engine is used

as engine in which fuel is burned and power is generated. This power is transmitted through transmission system to the wheel in the form of motion of the wheel.

Transmission system:

The engine's power is transferred to the wheel with the help of transmission system. In a conventional transmission system, there is a clutch, gear box, a propeller shaft and a differential or final drive.

Clutch:

The main purpose of the clutch is to allow the driver to couple or decouple the engine and transfer the motion. For the power transmission from engine to wheel the clutch must be in engaged position. When clutch is temporary decoupling the engine and wheel then gear are to be changed in running condition of vehicle.

Gear box:

In Gear box, there is a gearing arrangement to achieve different speed. Gear are used to obtain more than one speed ratio. When two mating gear have same number of teeth, both will rotate at the same speed and when one gear has less number of teeth than the other, the gear having less number of teeth rotate faster than the other gear.

Propeller shaft:

The propeller shaft has a hollow circular shaft which is used to transmit the power or rotational motion from the gear box to the final drive.

Final drive or differential:

It transfers the motion from propeller shaft to the rear wheel and it also turns the axis of rotation from propeller shaft by an angle of  $90^{\circ}$  to rear wheel.

Braking system:

Braking system are used to stop or slow down the vehicle. There are different braking system are used in automobile e.g. mechanical braking system, hydraulic braking system etc. In hydraulic braking system brake are applied by the pressure of fluid. Mechanical braking system are applied with the help of levers, linkages, pedals, cams, etc.

Steering system:

The main function of steering system is to give angular motion to front wheel so that the vehicle can take a turn. It also gives the directional stability to vehicle while

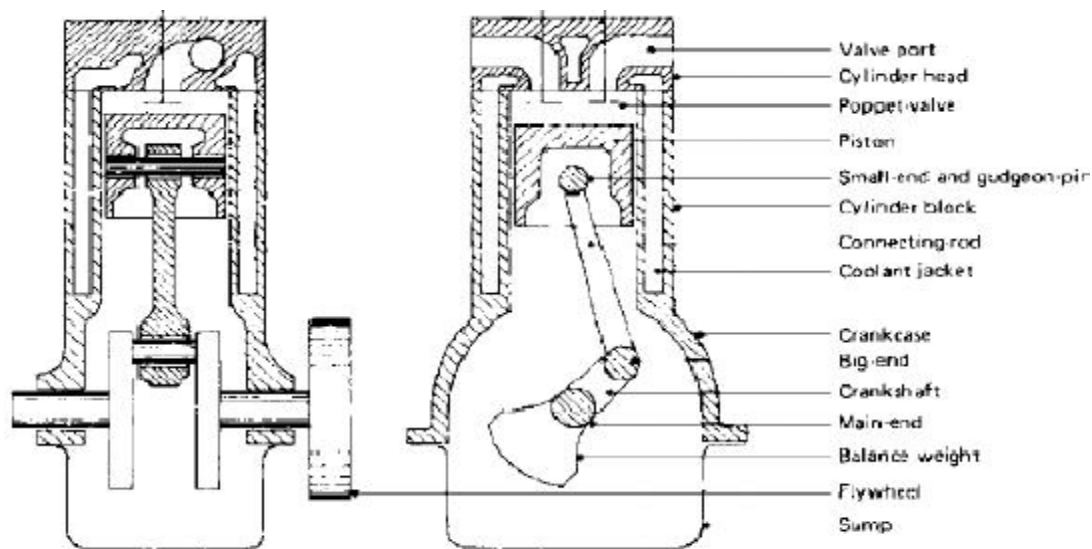
running the vehicle in straight direction.

Suspension system:

The main function of suspension system to absorb the shock and vibration produced by the irregularity of the road. The suspension system is given front end as well as rear end. It separates the wheel and the axel assembly of the vehicle from it's body.

### Components of an engine:-

Engine is a device which convert chemical energy into the mechanical work. There are two types of engines which are used in automobile, spark ignition engine and compression ignition engine.



The description of main components of IC engine is given below:

Cylinder block:

The cylinder of the multicylinder is made by casting process as a single unit, called as cylinder block. The cylinder head is mounted on the cylinder block. The cylinder block and cylinder head are provided water jackets in case of water cooling and fins in case of air-cooling.

Cylinder:

Cylinder is a vessel in which piston moves reciprocating motion. The cylinder is supported in cylinder block.

Piston:

It takes reciprocating motion in the cylinder. Due to its motion all thermodynamics process takes place in cylinder. It forms the first link in transferring the gas power to the shaft.

Combustion chamber:

The space enclosed in the upper part of the cylinder by the cylinder head and the piston top during combustion process is called combustion chamber. In combustion chamber the combustion of fuel takes place.

Connecting rod:

It connects the piston and crankshaft and transfers the gas power from piston to crankshaft. There are two ends of connecting rod, small end and big end. Small end is connected with piston by gudgeon pin and big end is connected with crankshaft by crankpin.

Crankshaft:

The main function of the crankshaft is to convert reciprocating motion of piston into rotary motion of the output shaft. The crankshaft is enclosed in a crankcase.

Piston ring:

Piston ring gives tight seal between piston and cylinder wall to prevent leakage of combustion gases. It is fitted into the slot of the piston.

Flywheel:

The main function of flywheel is to provide uniform torque to the output shaft. If flywheel is not provided in the engine then the angular velocity changes of the shaft during every one complete cycle of the engine.

Inlet manifold:

It is a pipe through which air or air-fuel mixture is drawn into the cylinder is called the inlet manifold. It connects the inlet system to inlet valve.

Exhaust manifold:

It is a pipe through which product of combustion escapes into the atmosphere is called exhaust manifold. It connects exhaust system to the exhaust valve.

Inlet and exhaust valve:

Inlet and exhaust valves are provided either on the cylinder head or side of the cylinder. The main function of inlet valve is to regulate the incoming charge in the cylinder. And the main function of exhaust valve is to regulate the discharge of the product of combustion.

from the cylinder.

Camshaft:

The main function of camshaft to control the opening and closing of inlet and outlet valve.

