Unit– 6
Front axle and steering mechanism

❖ Front Axle:- Functions

- It supports the weight of front part of the vehicle.
- It facilitates steering knuckles and suspension springs.
- It transmits weight of vehicle through springs to the front wheels.
- It absorbs torque applied on it due to braking of vehicle.

❖ FrontAxle

- The front axle is designed to transmit the weight of the automobile from the springs to thefront wheels, turning right or left as required.
- To prevent interference due to front engine location, and for providing greater stability and safety at high speeds by lowering the centre of gravity of the road vehicles, the entire centre portion of the axle is dropped.
- As shown in Fig. front axle includes the axle-beam, stub-axles, ack-rod and stub-axlearm.
- Front axles can be live axles and dead axles.
- A live front axle contains the differential mechanism through which theengine power flows towards the front wheels.
- For steering the front wheels, constant velocity joints are contained in theaxle half shafts.
- Without affecting the power flow through the half shafts, these joints help inturning the stub axles around the king-pin.
- The front axles are generally dead axles, which does not transmit power.
- The front wheel hubs rotate on anti-friction bearings of tapered-roller type on the steering spindles, which are an integral part of steering knuckles.
- To permit the wheels to be turned by the steering gear, the steering spindleand steering knuckle assemblies are hinged on the end of axle.

❖ The pin that forms the pivot of this hinge is known as king pin

or steeringknuckle pin.

❖ **Steering System:**

- **Steering** is the term applied to the collection of components, linkages, etc. which will allow a vehicle to follow the desired course.
- The front wheels are supported on front axle so that they can swing to left or right for steering. This movement is produced by gearing and linkage between the steering wheel in front of the driver and the steering knuckle or wheel.
- The complete arrangement is called "Steering System".
- The function of steering system is to convert the rotary movement of the steering wheel into angular turn of the front wheels.
- The steering system also absorb a large part of the road shocks, thus preventing them from being transmitted to the driver.

❖ **Requirements:**

- It should multiply the turning effort applied on the steering wheel by the driver.
- It should not transmit the shocks of the road surface encountered by wheels to the driver hands.
- The mechanism should have self-returning property so that when the driver releases the steering wheel after negotiating the turn, the wheel should try to achieve straight ahead position.

❖ **Functions:**

- It helps in swinging or turning the wheels to the left or right (at the will ofdriver).
- It converts the rotary movement of the steering wheel into an angular turn ofthe front wheels.
- It multiplies the effort of the driver by leverage in order to make it fairlyeasy to turn the wheels.
- It absorbs a major part of the road shocks thereby preventing them to gettransmitted to the hands of the driver
- It provides directional stability.
- It helps in achieving the self-returning effect.

❖ **Front wheel steering Geometry:**

The term "*steering geometry*" (also known as "front-end geometry") refers to the angular Relationship between suspension and steering parts, front wheels, and the road surface. Because alignment deals with angles and affects steering, the method of describing alignment measurements is called steering geometry.

1. Castor
2. Camber
3. King Pin Inclination (Steering axis Inclination)
4. Scrub Radius
5. Toe-in or Toe- Out

Uni

t 7 brakes Types

of Braking

System in

Automobile

"An object remains in its state of rest or in motion until and unless acted upon by an external force" Newton's first law of motion, this law by Sir Isaac Newton gave rise to the development of braking

system in an automobile, developing an automobile vehicle not only requires the power source but also the efficient braking system as higher the horse power higher will be the brake force required to stop or de accelerate that vehicle. This thought gave rise to many researches in the field of braking and results in its evolution due to which today we have flexibility in choosing a suitable braking system according to our need. So let's just start our article with the curiosity about the various types of braking system.

In an automobile vehicle, a braking system is an arrangement of various linkages and components (brake lines or mechanical linkages, brake drum or brake disc, master cylinder or fulcrums etc) that are arranged in such a fashion that it converts the vehicle's kinetic energy into the heat energy which in turn stops or de accelerate the vehicle.

The conversion of kinetic energy into heat energy is a function of frictional force generated by the frictional contact between brake shoes and moving drum or disc of a braking system.

Need of a Braking System

In an automobile vehicle braking system is needed –

- To stop the moving vehicle.
- To de accelerate the moving vehicle.
- For stable parking of a vehicle either on a flat surface or on a slope.
- As a precaution for accidents.
- To prevent the vehicle from any damage due to road conditions.
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Classification of Braking System

As we have already discussed the evolution of braking system from vintage carts to modern cars, from vintage carriages to modern trucks has given us various different purpose braking systems which are classified on the basis of various needs and purposes of an automobile vehicle. so let's just discuss them-

1. On the Basis of Power Source

The power source which carries the pedal force applied by the driver on brake pedal to the final brake drum or brake disc in order to de accelerate or stop the vehicle the braking systems are of 6 types-

1. Mechanical braking system
2. Hydraulic braking system

3. Air or pneumatic braking system
4. Vacuum braking system
5. Magnetic braking system
6. Electric braking system

2. On the Basis of Frictional Braking Contact

On the basis of the final friction contact made between the rotating brake components i.e. brake drum or disc rotor and the brake shoe the braking systems are of 2 types-

(i) Internal expanding brakes (e.g.- drum brakes)

(ii) External contracting brakes (e.g. disc brakes)

3. On the Basis of Application-

On the basis of method of applying brakes, braking systems are of 2 types-

(i) Foot or service brakes
(ii) Hand or parking brakes

4. On the Basis of Brake Force Distribution

(i) Single acting brakes
(ii) Dual acting brakes

Anti-lock braking system

An **anti-lock braking system** (**ABS**) is a safety anti-skid braking system used on aircraft and on land vehicles, such as cars, motorcycles, trucks, and buses. ABS operates by preventing the wheels from locking up during braking, thereby maintaining tractive contact with the road surface and allowing the driver to maintain more control over the vehicle.

ABS is an automated system that uses the principles of threshold braking and cadence braking, techniques which were once practiced by skillful drivers before ABS was widespread. ABS operates at a much faster rate and more effectively than most drivers could manage. Although ABS generally offers improved vehicle control and decreases stopping distances on dry and some slippery surfaces, on loose gravel or snow-covered surfaces ABS may significantly increase braking distance, while still improving steering control. Since ABS was introduced in production vehicles, such systems have become increasingly sophisticated and effective. Modern versions may not only prevent wheel lock under braking, but may also alter the front-to-rear brake bias. This latter function, depending on its specific capabilities and implementation, is known variously as electronic brakeforce distribution, traction control system, emergency brake assist, or electronic stability control (ESC).