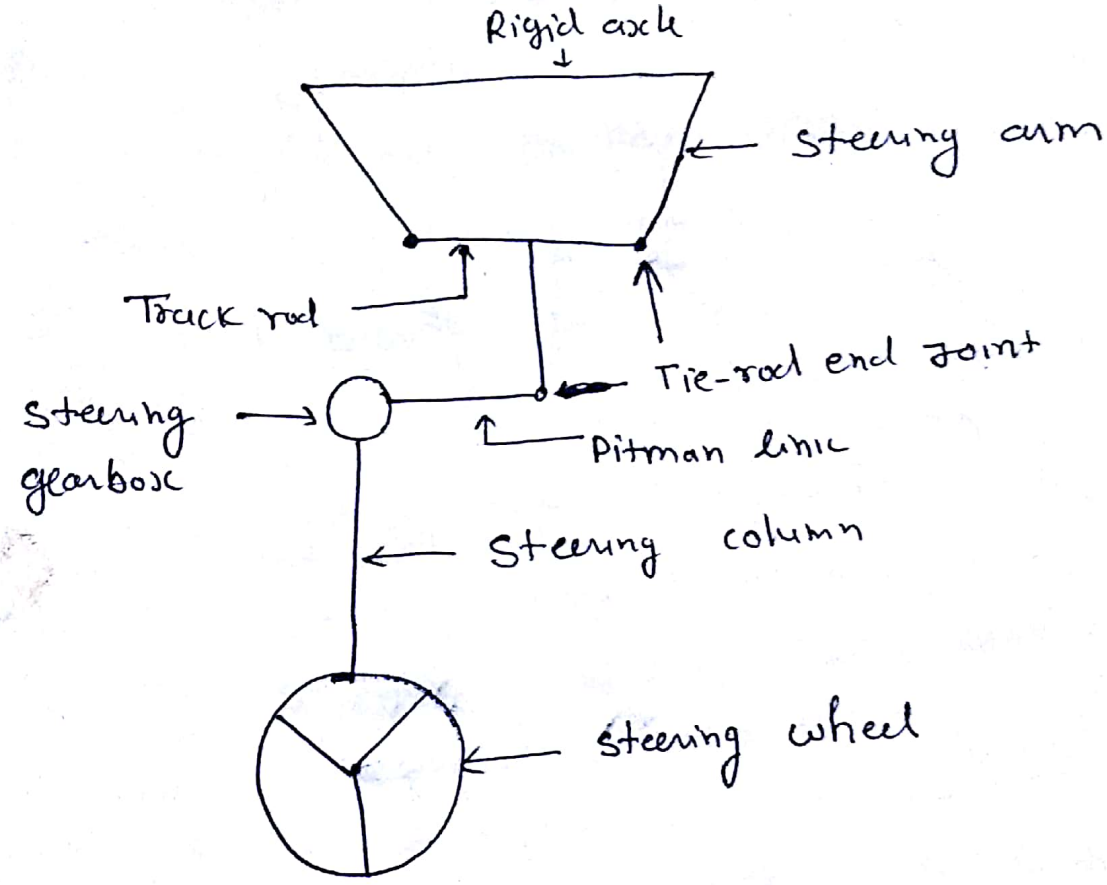
Ans(2). Steering System :→ It is an assembly of linkages that are used to provide directional control to the vehicle. In controlling the vehicle, an input effort is given to a steering wheel by the driver whose output comes in the form of a lateral movement of the road wheels.



Types of steering System :→

(I) Front wheel steering
(II) All wheel steering
(III) Manual steering
(IV) Power Steering
(V) Reversible, Irreversible and Semi-reversible steering.

→ For salient features refer page no. 140 (K.M Gupta, vol. 2)

rel-actual plane

Requirements of a Good Steering System :→

· Following requirements are desired in a good steering system.

(i) vehicle should get steered with a minimum of effort.

(ii) Steering mechanism should work accurately and provide Pure rolling as far as possible.

(iii) The steering system should not be affected by the side thrusts, cornering forces and wind effects.

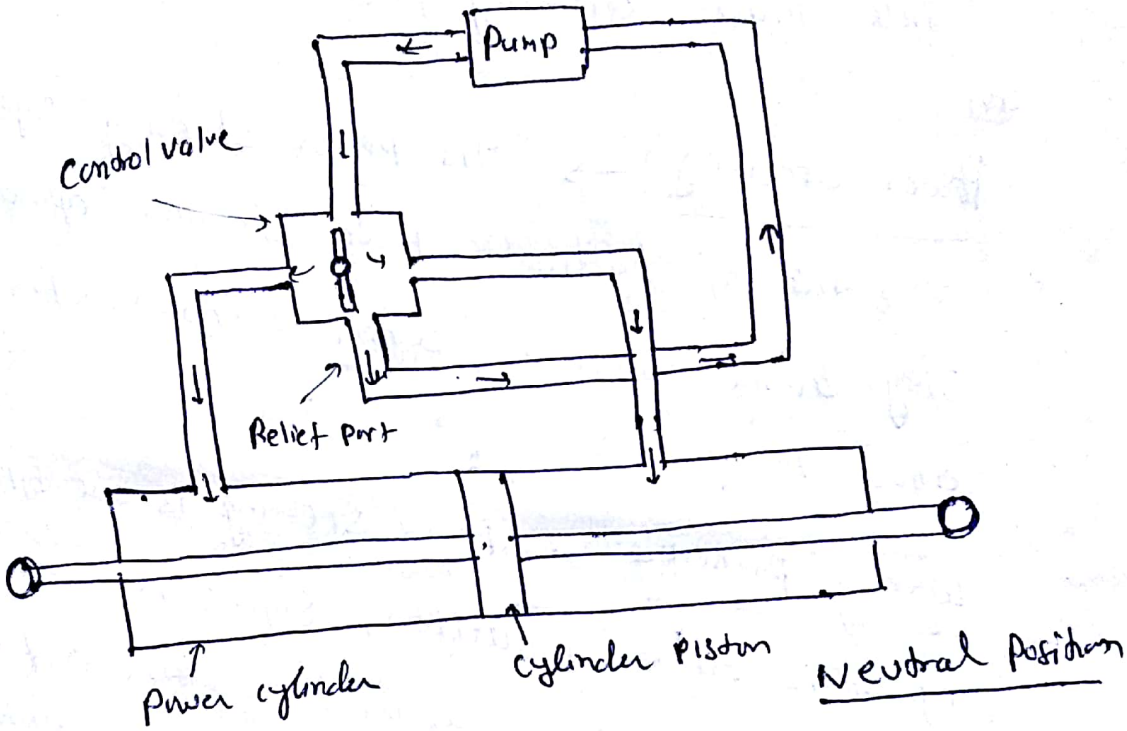
Power Steering :→ The power steering systems take assistance of hydraulic power for their operation. They become operative when manual effort exceeds about 10 N.

Working principle :→ Power steering is one type of hydraulic device for utilizing Engine Power as steering effort. Consequently, the engine is used to drive a pump to develop fluid Pressure. This pressure acts on a piston within the power cylinder so that the piston assists the rack effort. The working principle of a power steering in neutral and in turning conditions can be understood as follows.

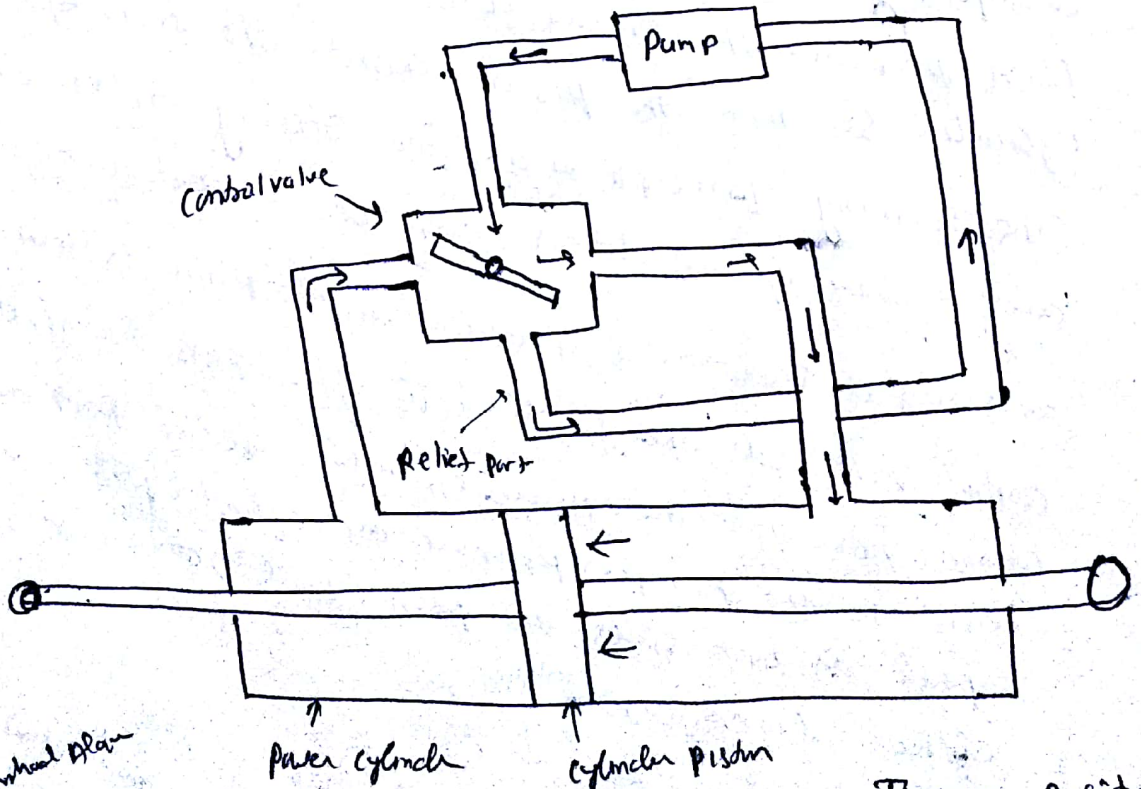
(a) Neutral position :→ Fluid from the pump is sent to control valve; the fluid will flow pass through the control valve into the power cylinder, relief port and back to the pump. Pressure on cylinder piston is Equal on both sides, the piston will not move in either direction.

Scanned by CamScanner

(b) Turning Position:→ In this position, control valve closes one of the fluid passage. The other passage then opens wider, causing a pressure difference occurs between both side of piston and piston moves in the direction of lower pressure.



Neutral Position



Turning Position

3. Ans. Ignition System :→ An ignition system in an automobile is meant for igniting the air-fuel mixture inside the cylinder. The ignition has to be performed at a pre-set timing. The ignition of mixture requires a spark in spark ignition Engines.

Types of Ignition Systems :→

(I) Battery ignition system
(II) magneto ignition system
(III) Electronic ignition system
(IV) magnetic pulse ignition system
(V) Piezoelectric ignition system

For features refer page no. 357, 358 (K.m Gupta, vol. 1)

Requirements of an efficient ignition system :→

(I) Spark must occur continuously & timely
(II) There should not be any misfire.
(III) sufficient spark for ignite the charge
(IV) It should be simple, cheap, & contained as a compact unit.

For Battery ignition System refer page no. 358, 359 (K.m Gupta, Vol 1)

not. Instead pla~

Ans (4) → Given:

Angle of inclination of road level, $\alpha = 0^\circ$

initial speed of car, $u = 60 \text{ km/hr}$

$= \frac{60 \times 1000}{3600} = 16.66 \text{ m/s}$

wheel base, $l = 2.76 \text{ m}$

Distance of C.G from ground level $h = 500 \text{ mm}$
$= 0.5 \text{ m}$

Distance of C.G from rear wheel $x = 1.1 \text{ m}$

Case (i) Brakes are applied to rear wheels:

$$a = \frac{\mu \cdot g (l - x)}{l + \mu h} = \frac{0.5 \times 9.81 (2.76 - 1.1)}{2.76 + 0.5 \times 0.5}$$

$a = 2.705 \text{ m/sec}^2$ (Retardation)

$v^2 = u^2 - 2as \quad (v = 0,)$

$0^2 = (16.66)^2 - 2 \times 2.705 \times s$

$\therefore s = 51.3454 \text{ m}$

Case (ii) Brakes are applied to the front wheels

$$a = \frac{\mu g x}{l - \mu h} = \frac{0.5 \times 9.81 \times 1.1}{2.76 - 0.5 \times 0.5} = 2.149 \text{ m/s}^2$$

(retardation)

$v^2 = u^2 - 2as$

$0 = (16.66)^2 - 2 \times 2.149 \times s$

$\therefore s = 64.611 \text{ m}$

mech. Infinite Plan

Case(iii) Brakes are applied to all four wheels.

$$a = \mu g = 9.81 \times 0.5 = 4.905\ m/sec^2 \quad \text{(retardation)}$$

$$v^2 = u^2 - 2as$$

$$0 = (16.66)^2 - 2 \times 4.905 \times S$$

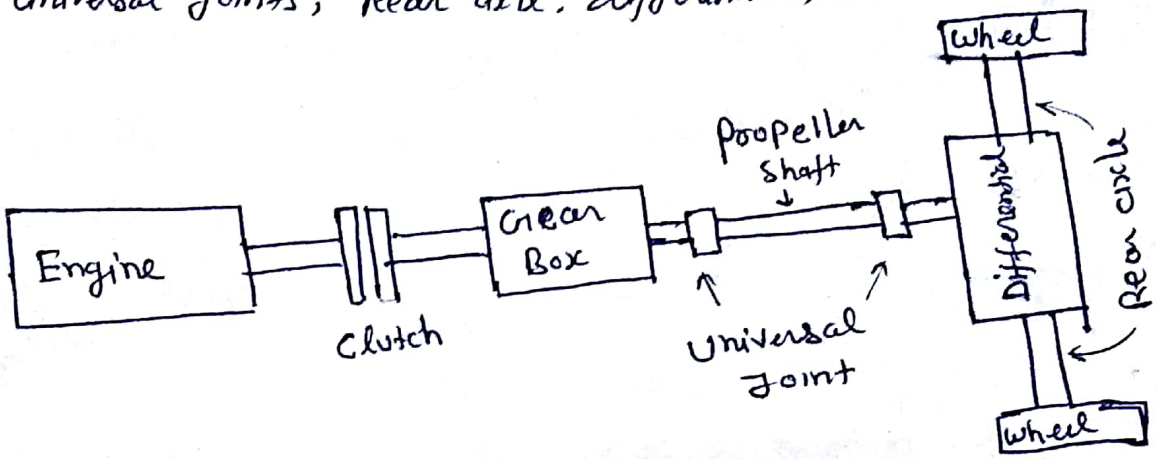
$$\therefore \boxed{S = 28.3158\ m}$$

1.1 Ans:→ Refer class notes (dated 22/10/18 & 23/10/18).

Ans(5) - Transmission System (or ~~Power Train~~) :→

The mechanism that transmits the power developed by the engine of automobile to the driving wheels is called the transmission system or ~~Power train~~.

It is composed of clutch, gear box, propeller shaft, universal joints, Rear axle, differential, etc.



Types of Transmissions (Gearboxes)

(I) manual transmission →
- Sliding mesh
- Constant mesh
- Synchromesh with overdrive
- Synchromesh without overdrive

(II) Semi-automatic transmission →
- Electric controlled with a fluid drive
- Electric controlled with overdrive
- Fluid-torque drive

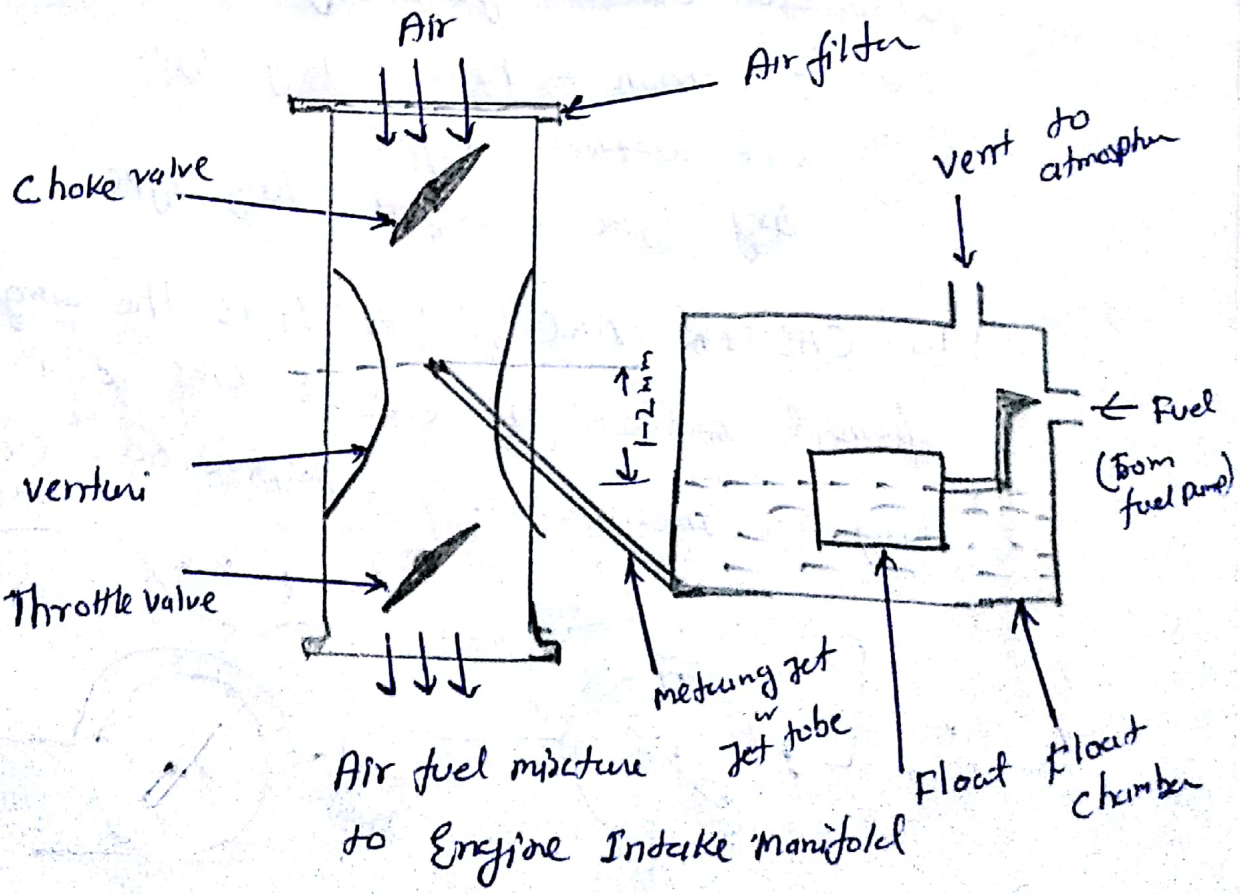
(III) Automatic transmission →
- Hydramatic drive
- Torque-converter drive

For Sliding mesh gear box & power flow path,
refer page no. 443, 444 (K.M Gupta, vol 1)

Ind. Instruct Plan

Ans(1) CARBURETTOR :→ It is a device for atomizing and vaporizing the fuel and mixing it with the air in varying proportions to suit the changing operating conditions of motor-vehicle engines. This Process of breaking up and mixing the gasoline (fuel) with the air is called carburation.

Vaporization is a change of state of the fuel from a liquid to a vapor, whereas atomization is a mechanical breaking-up of the liquid fuel into small particles so that every minute particle of the fuel is surrounded by air.



(Simple carburettor)

mel. Irfhel Dhu

(II) AIR CLEANER :→ It is installed on engine to act as air-filtering unit. It protect the engine from excessive wear, deposits and sludge that otherwise might result from the dust and dirt drawn into the engine with the carburetter air.

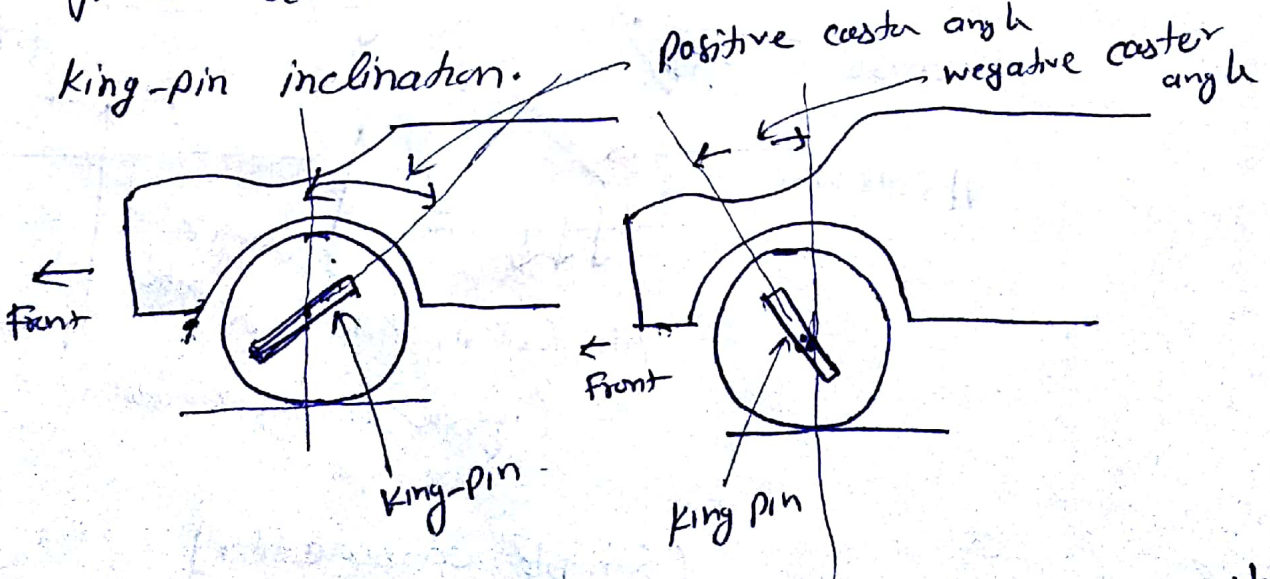
Note (i) It acts as a silencer by reducing the level of the hissing noise for carburetter intake.

(ii) It suppresses the noise emanating from the engine to a low level due to acoustically damping nature of its filters.

The air cleaners generally used are of following types.

(a) Oil bath or heavy duty type
(b) Oil wetted type
(c) Dry type or light duty type

(III) CASTER ANGLE :→ It is the angle formed between the vertical line and the king-pin inclination.



Md. Irshad Alam

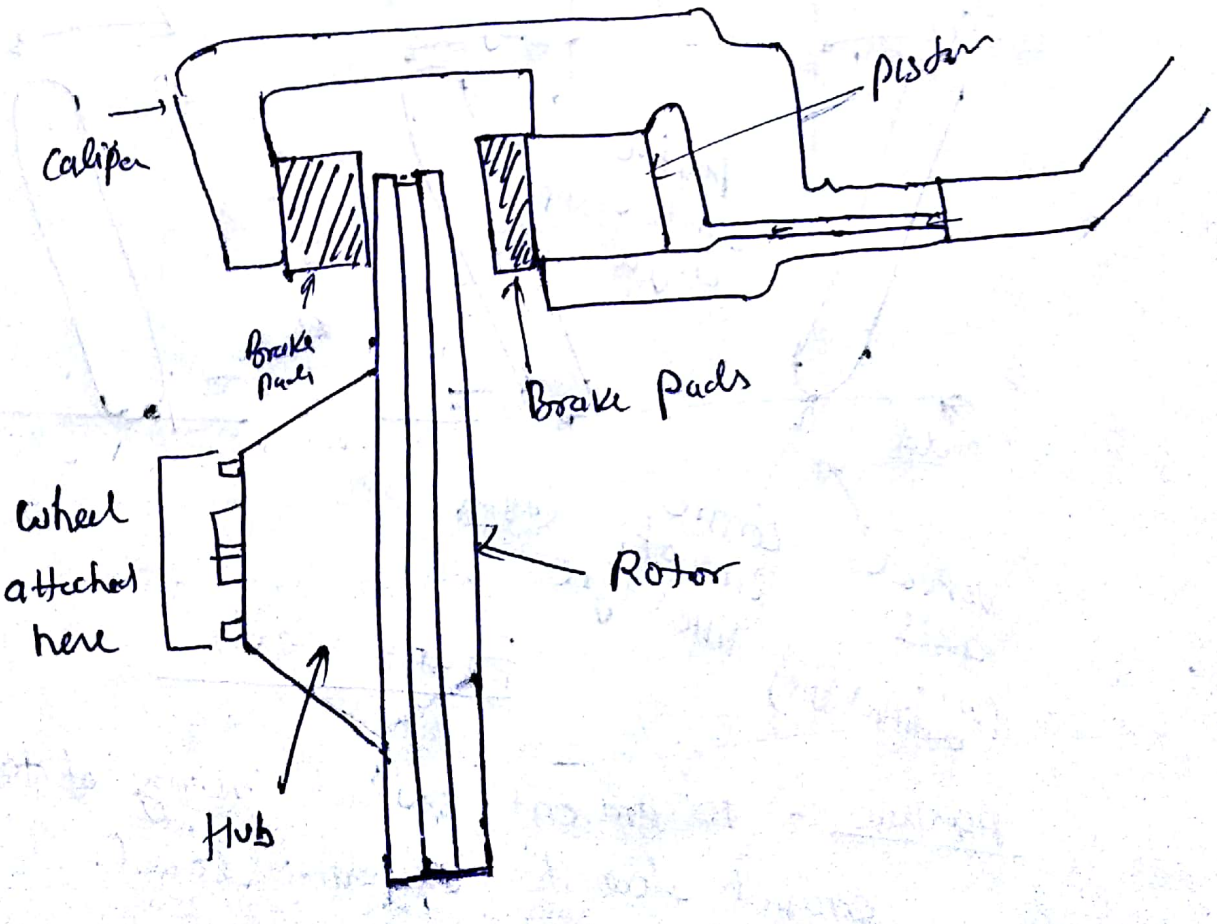
Purpose :→

(a) Produce directional stability
(b) minimize tendency of wheel wander
(c) avoid oscillation of front wheels.

(IV) SLIP ANGLE :→

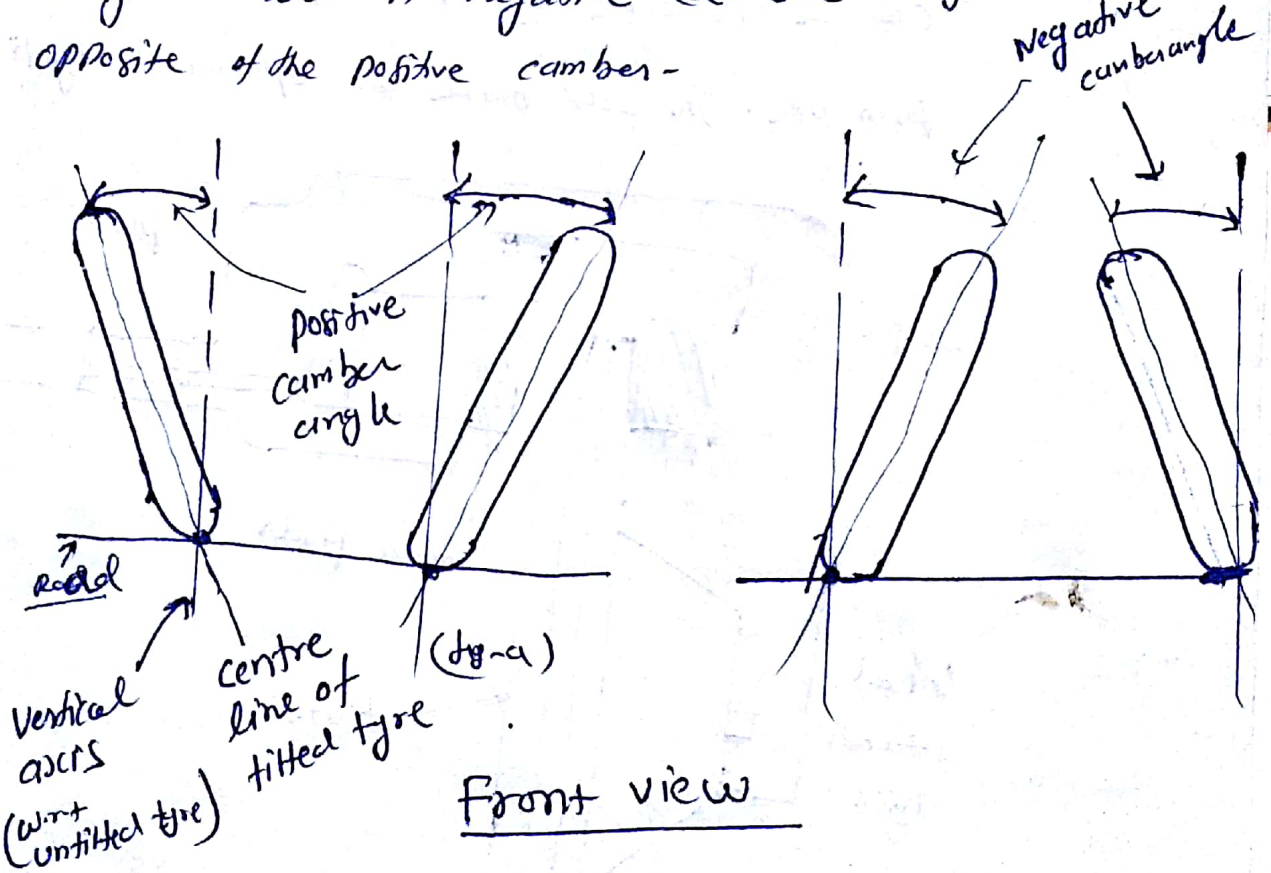
(Refer page no. 152, K.m Gupta vol-2)

(VIII) Disc brakes :→ DISK brakes are similar to disk clutches in terms of construction and operating principles. The disc brakes are operated hydraulically.



(IX) Fuel tank :- Refer class notes

(V) CAMBER ANGLE :→ The front wheels are usually mounted in such a way that they are tilted outwards at the top and inwards at the bottom, when viewed from the front of the vehicle (fig a). Due to such positioning, the centre line of the tyre forms an angle with its vertical. This angle is known as camber angle (positive camber angle) or only camber. A negative camber is just opposite of the positive camber.



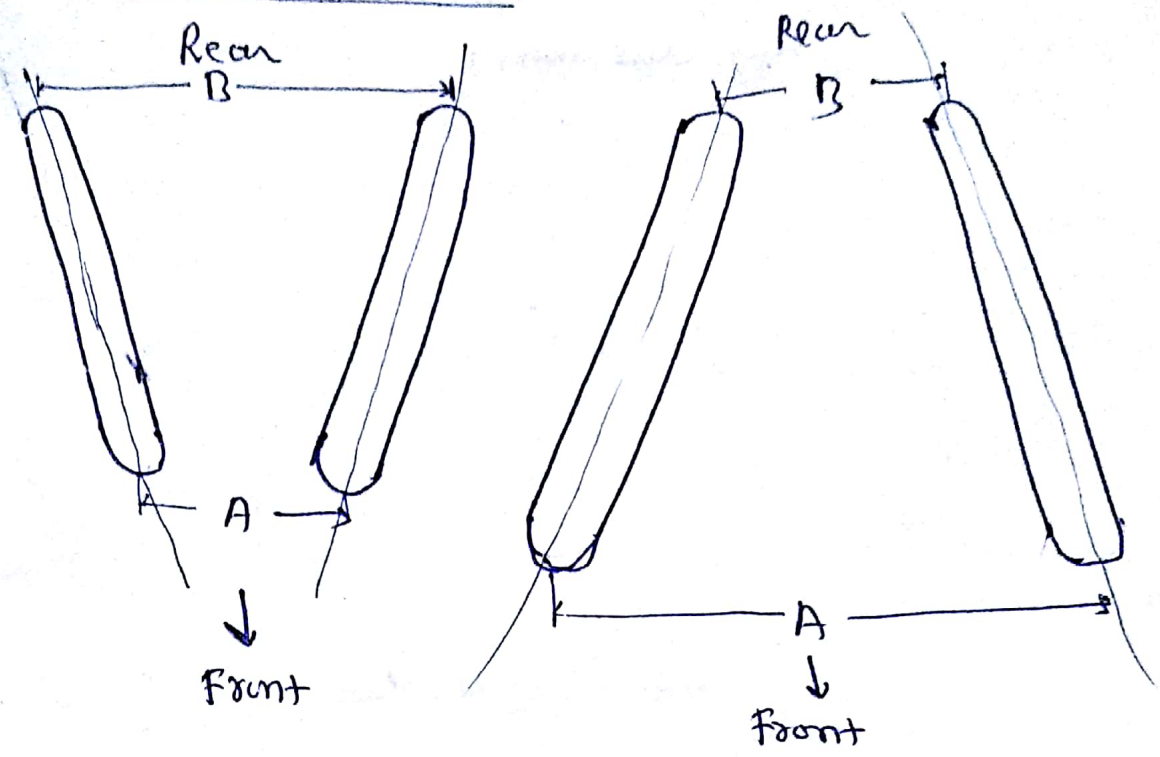
Purpose :- To prevent inward tilting of top of wheels caused due to excessive load.

Note

(a) Kept b/w 0° to 1.5°

(b) The camber on both the wheels must be equal in amount otherwise the vehicle will roll-on in the direction of the wheel having a larger camber.

(vi) TOE-IN AND TOE-OUT :→



Toe-In = B-A

Toe-out = A-B

(Initial Setting of front wheels)

TOP- VIEW

Purpose:→

→ The purpose of toe-in is to offset the tendency of wheel rolling on the curve due to the limitation of correct steering and due to camber effort

→ The purpose of toe-out is to counter the tendency of inward rolling of wheels due to the soil condition on agricultural land and on account of side thrust and cross-wind effects.

Note:→ The amount of toe-in varies from 0 to 6 mm.

ml. Mithal Sharma