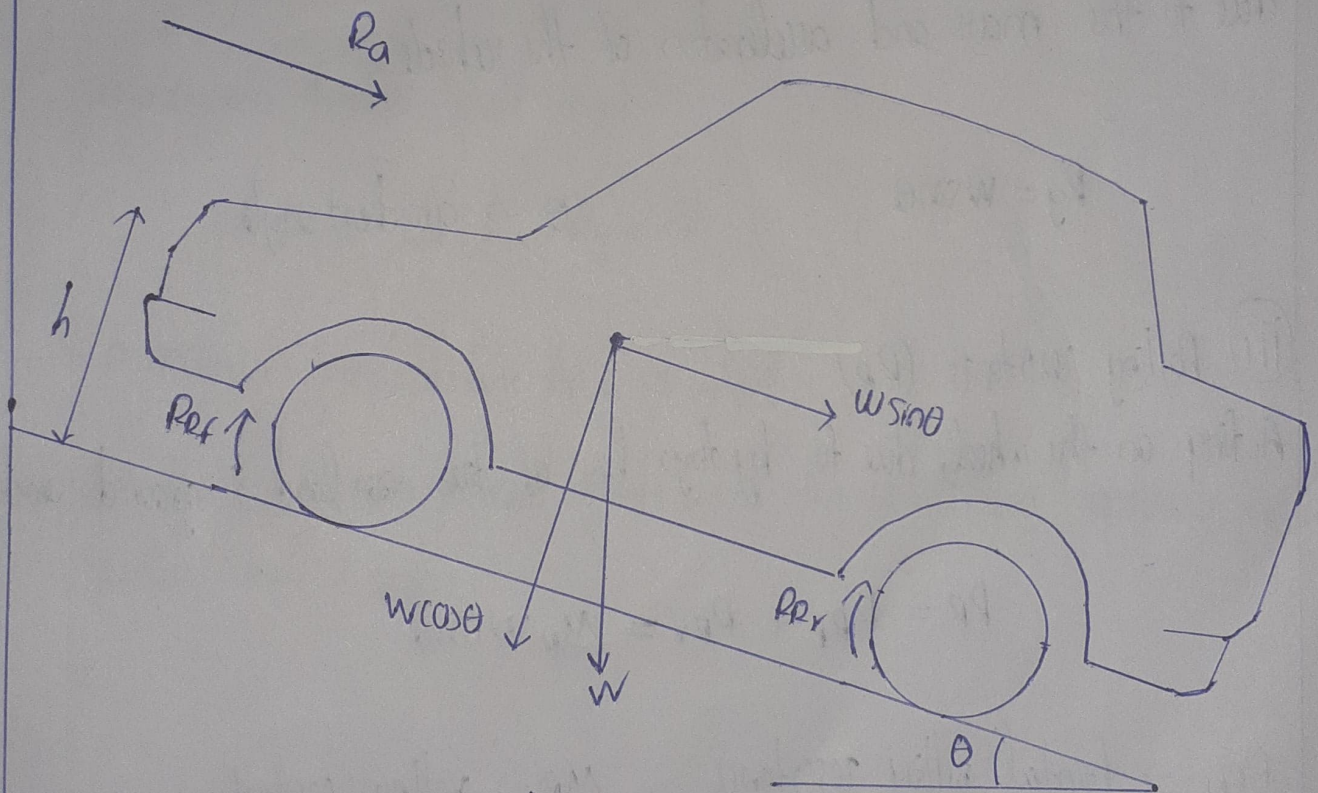


Assignment-2

Submitted by - Sreenath B

① Equation of motion and maximum tractive effort

Consider a vehicle with mass ' m ' and at an inclination θ ,



Here the forces that are acting are,

① Aerodynamic force/resistance (R_a)

is the force exerted by the air when travelling,

$$R_a = \frac{1}{2} \rho C_d A v^2$$

$\rho \rightarrow$ density of air

$C_d \rightarrow$ coefficient of drag

$A \rightarrow$ projected area

$v \rightarrow$ velocity.

(ii) Gravitational force (R_g)

due to the mass and acceleration of the vehicle.

$$R_g = W \sin \theta$$

$\theta \rightarrow$ gradient angle

(iii) Rolling resistance (R_R)

Acting on the wheel, due to hysteresis loss of tire, ~~road~~ load & ground conditions.

$$R_R = R_{Rf} + R_{Rr} = M_R W \cos \theta$$

$R_{Rf} \rightarrow$ frontal rolling resistance

$M_R \rightarrow$ rolling coefficient

$R_{Rr} \rightarrow$ rear rolling resistance

$\theta \rightarrow$ gradient angle

(iv) Tractive force (F_T)

$\rightarrow$ It is the driving force delivered by the engine/power plant.

②

$$F_T = F_{Tf} + F_{Tv} \rightarrow \text{traction}$$

↓
friction

⑤ Acceleration resistance (f_v)

resistance provided by mass $\times$ acceleration,

$$f_v = ma$$

$\therefore$ maximum tractive effort (F_T)

$$F_T = f_v + R_a + R_g + R_r$$

→ maximum gradeability for a $\angle$ wheel:

→ It is the maximum percent grade which the vehicle can traverse for a specified time $\times$ speed.

②

Given that

$$m_{\text{all}} = m = 1765 \text{ kg}$$

$$\text{Axe to axle length} = l = 2.84 \text{ m}$$

$$\text{front longitudinal length} = a_1 = 1.22 \text{ m}$$

$$\text{rear longitudinal length} = a_2 = 1.62 \text{ m}$$

~~load~~ load on the front, $F_f = a_2/l \times m$

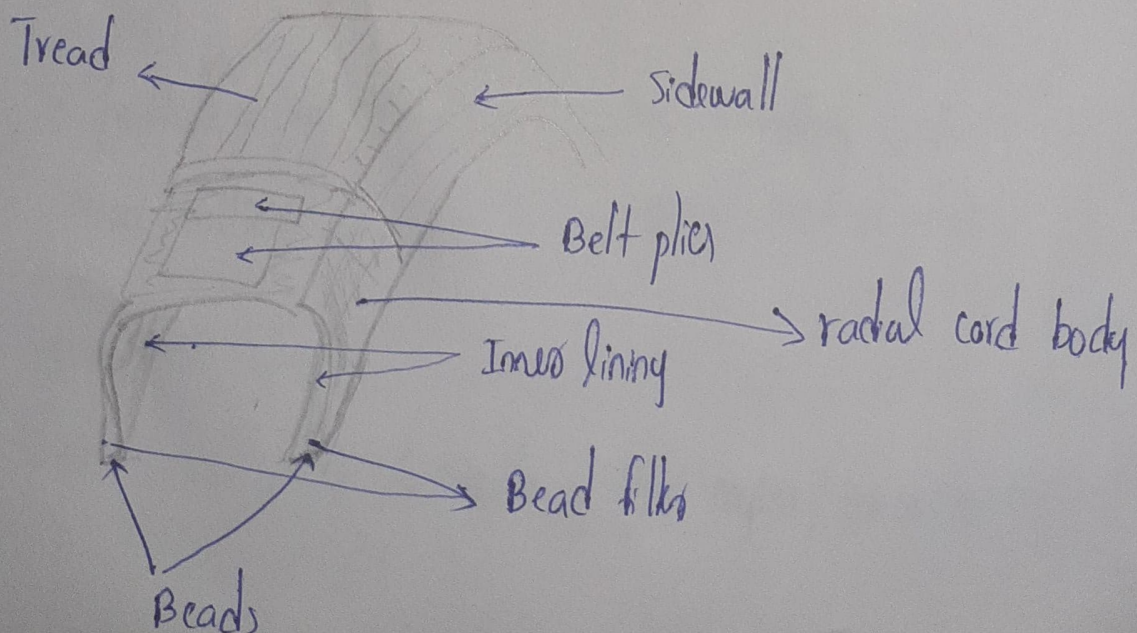
$$= \cancel{758.20 \text{ kg}} \quad \underline{\underline{1006.8 \text{ kg}}}$$

load on the rear, $F_r = a_1/l \times m$

$$= \underline{\underline{758.21 \text{ kg}}}$$

③

Different parts of tire



Beads → which hold the tire to rim, they are made of copper, brass or braided high tensile steel wires wound into a rubber band.

Bead filler → They are rubber compound inside beads, which provides stability to the lower sidewall and bead area.

Radial cord body → The cord body gives the tire strength and transmit cornering forces from tread to wheel.

Inner lining → which is a rubber compound bonded to the inside of cord body that retains air under pressure. functions like an inner tube.

Belt ply → Belt ply are two or more strong layers of cord just under tread. Provides strength & stability to the tread.

sidewall → Area of the tire from head to head. Protective covering for cord body.

Tread → Part of the contact with surface. which have balance wear, traction, handling, fuel economy, resistance

→ Types of tyre basic construction

① Cross ply tyre construction

→ tyre has better a resistance against wear, have good bonding to road.

→ this type consist of carcass layers made from nylon cord which are placed ~~ed~~ diagonally along each others in tread and sidewalls, at angle of 50°

Advantages:-

→ provides high vehicle stability

→ provide good resistance against sidewall damage

→ economical & cheaper

disadvantages:-

→ tyre heat up quickly

→ less comfortable

→ due to high resistance of tyre, fuel consumption high

② Radial ply tire construction

- consist of a carcass of ply which is formed by textile arcs running one head to the other.
- each ply embedded at an angle of 90° to rolling direction.

Advantages:-

- less rolling resistance, less fuel consumption.
- have longer tread life, less heat generated.
- better buoyancy efficiency
- have longer resistance to punctures & cuts.

Disadvantages:-

- vulnerable sidewalls
- buoyancy due to harder tread.