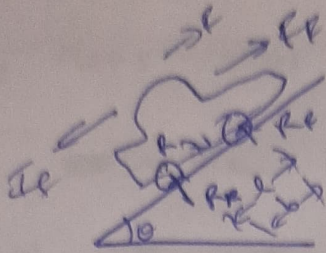


Assignment - 2

1) any



W = weight of car

C_G = center of gravity

b = wheel base

f = max^m forward acceleration

F_f = max^m tractive effort

R_r & R_f = Rear & front wheel

R_r & R_f = Total normal reaction at front and rear wheel

h = height from C_G to road

IF = inertia force = $mf - W \sin \theta$

$$= \frac{W}{g} f - W \sin \theta$$

$$\sum V = 0 \quad \text{--- (2)}$$

$$\sum H = 0 \quad \text{--- (3)}$$

Using (2)

$$W \cos \theta = R_r + R_f \quad \text{--- (4)}$$

Using (3)

$$F_f = \frac{W}{g} f + W \sin \theta$$

$$M R_f = \frac{W}{g} f + W \sin \theta$$

$$R_f = \frac{W}{g} f + \frac{W}{\mu} \sin \theta \quad \text{--- (7)} \quad \frac{W}{\mu} \left\{ \frac{f}{g} + \sin \theta \right\}$$

Taking moment about Y

$$R_F \times b + \left(\frac{\omega l}{g} + \omega b \sin \theta \right) u = \omega l \cos \theta + l$$

$$\left(\frac{f}{g} + \frac{\sin \theta}{\mu} \right) b + \left(\frac{f}{g} + \sin \theta \right) u = l \cos \theta$$

$$\frac{b}{\mu} \left(\frac{f}{g} + \sin \theta \right) + \left(\frac{f}{g} + \sin \theta \right) u = l \cos \theta$$

$$\left(\frac{f}{g} + \sin \theta \right) \left(\frac{b}{\mu} + u \right) = l \cos \theta$$

$$\left(\frac{f}{g} + \sin \theta \right) = \frac{l \cos \theta}{\left(\frac{b}{\mu} + u \right)} \quad \text{--- (8)}$$

$$\frac{f}{g} = \left(\frac{l \cos \theta}{\left(\frac{b}{\mu} + u \right)} \right) - \sin \theta$$

$$F = g \left[\left[\frac{l \cos \theta}{\left(\frac{b}{\mu} + u \right)} \right] - \sin \theta \right] \quad \text{--- (9)}$$

$$R_F = \frac{\omega}{\mu} \times \frac{l \cos \theta}{\left(\frac{b}{\mu} + u \right)} \quad \text{--- (10)} = \frac{\omega l \cos \theta}{b + \mu u}$$

$$R_R = \omega l \cos \theta - R_F = \omega l \cos \theta - \frac{\omega l \cos \theta}{\left(\frac{b}{\mu} + u \right)}$$

$$= \omega l \cos \theta \left[1 - \frac{1}{\left(\frac{b}{\mu} + u \right)} \right]$$

$$= \omega l \cos \theta \left[\frac{b + \mu u - 1}{b + \mu u} \right]$$

$$F_F = \mu R_F = \mu \times \left(\frac{\omega l \cos \theta}{b + \mu u} \right)$$

Four wheel drive

$$F = R_F + R_R = M R_R + M R_F$$

$$\sum U = 0, \quad W = R_F + R_R$$

$$\begin{aligned} \sum H = 0, \quad \left(\frac{W}{g}\right)F &= M R_R + M R_F \\ &= M(R_R + R_F) = M W \end{aligned}$$

$$(F/g) = M$$

$$\sum U = 0$$

$$W = R_R + R_F$$

$$\sum H = 0$$

$$(W/g)F = M R_R + M R_F$$

Assuming slope same at front wheels

$$\text{Ans } R_F < R_R \text{ then,}$$

$$\sum M_R = 0, \quad 2 M R_F = (W/g)F$$

$$R_F b + (W/g)F h = W$$

$$M = 1765 \text{ kg}$$

$$l = 2.84 \text{ m}$$

$$a_1 = 1.22 \text{ m}$$

$$a_2 = 1.62 \text{ m}$$

$$\text{Load on front axle} = F_{FR} = mg \left(\frac{a_2}{l}\right)$$

$$\text{Load on rear axle} = F_{AR} = mg \left(\frac{a_1}{l}\right)$$

$$F_{AR} = mg \left(\frac{a_1}{l}\right) = 1765 \times 9.8 \left(\frac{1.22}{2.84}\right)$$

$$= 17297 \times 0.429$$

$$= 74304 \text{ N}$$

load on rear
axis

$$= 74304 \text{ N}$$

$$F_{FR} = mg \left(\frac{a_2}{l}\right)$$

$$= 1765 \times 9.8 \left(\frac{1.62}{2.84}\right)$$

$$= 17297 \times 0.570$$

$$= 98665.59 \text{ N}$$

load on front

$$\text{axis} = 98665.59 \text{ N}$$

3) Tire Parts

a) Beads

We'll start from the inside out the beads hold the tire to the rim at the outer edge of wheel. They're made of copper, brass or bronze. Plated high tensile steel wires wound into a rubber band.

b) Bead filler

is a rubber compound inside the tire's beads. It provides stability to the lower sidewall and bead area.

3) Radial Cord Body

The cord body gives the tire strength and transmits compressing forces from the tread to the wheel. Rubber coated fabric coat, called body plies make up the cord body.

4) Inner liner

The inner liner is rubber compound bonded to the inside of cord body that retains air under pressure.

5) Belt plies

Belt plies are two or more strong layers of cord just under the tread area of the tire.

The primary function of belt plies is to provide strength and stability to the tire tread.

6) Side wall

The area of a tire from the bead to the tread - the side of the tire is called the sidewall.

7) Tread

The tread is ~~the~~ the portion of the tire that comes in contact with the road surface.