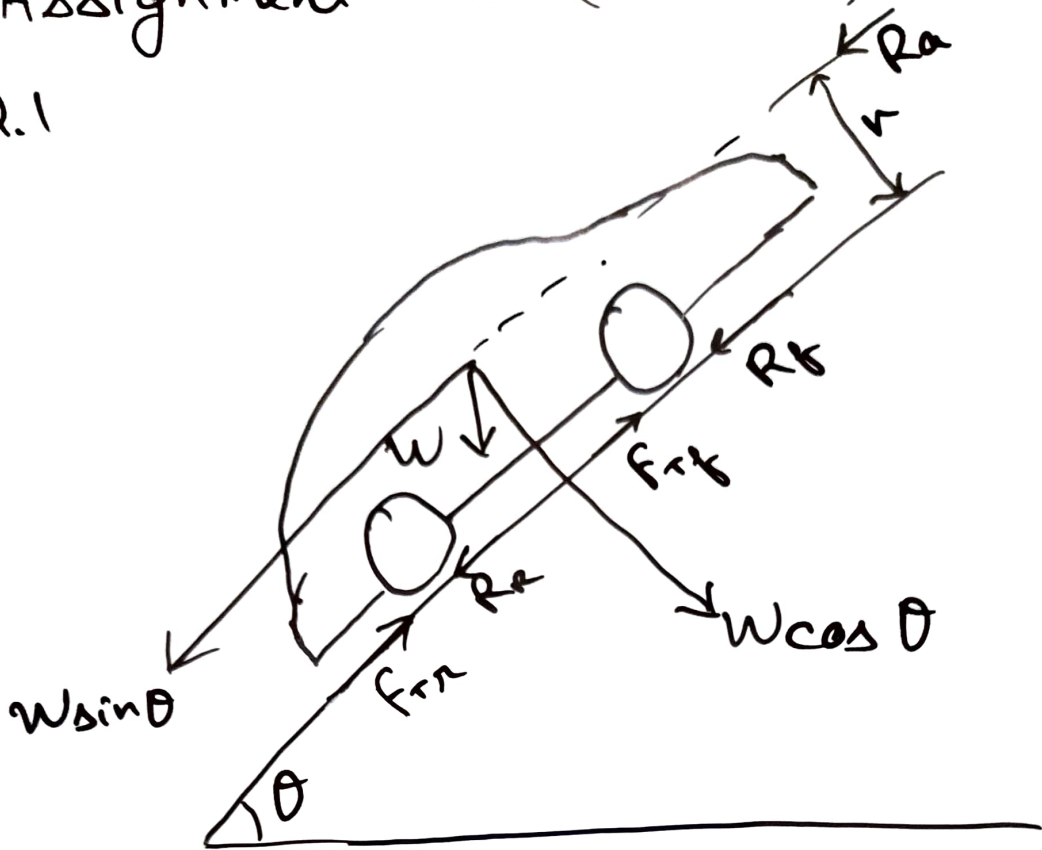


Assignment - 2 (Unit - 2)

Q.1



$$F_T = ma + R_a + R_r + W \sin \theta$$

$$F_T = ma + \frac{1}{2} \rho C_d A v^2 + R_r + W \sin \theta$$

$$F_{Tf} + F_{Tr} = ma + \frac{1}{2} \rho C_d A v^2 + R_r + W \sin \theta$$

$$(\mu_f + \mu_r) W \cos \theta = ma + \frac{1}{2} \rho C_d A v^2 + R_r + W \sin \theta$$

Considering

$$v = 0$$

and $a = 0$ for Gradeability

$$(\mu_f + \mu_r) w \cos \theta = R_R + w \sin \theta$$

$$(\mu_f + \mu_r) = \mu$$

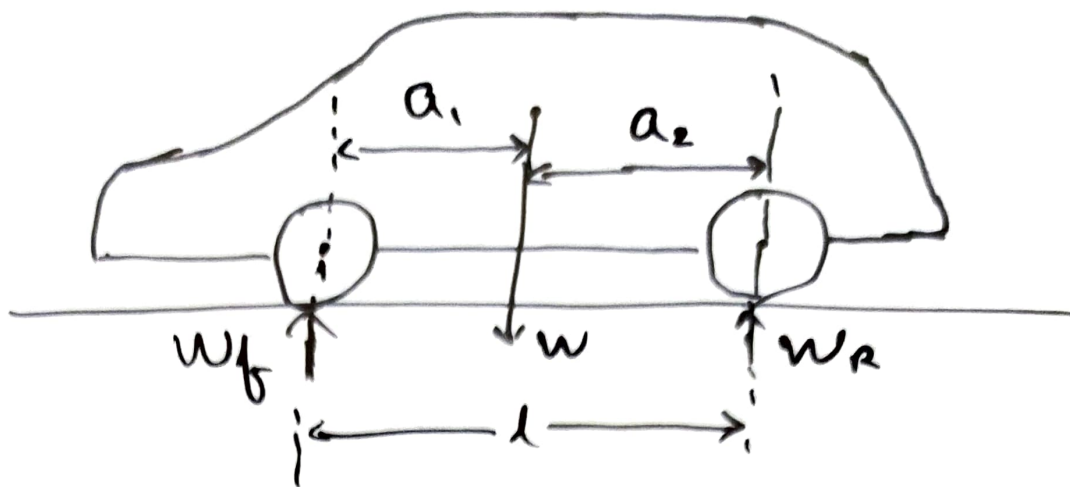
$$\mu w \cos \theta = \mu_r w^{\sin \theta} + w \sin \theta$$

$$\mu \cos \theta = (1 + \mu_r) \sin \theta$$

$$\tan \theta = \frac{\mu \rightarrow \text{Friction}}{1 + \mu_r \rightarrow \text{Rolling}}$$

$$\theta = \tan^{-1} \left[\frac{\mu}{1 + \mu_r} \right]$$

Q.2



$$W_f + W_R = W = mg \quad \text{--- (1)}$$

Also

$$\sum M_f = 0$$

$$W a_1 + W_R l = 0$$

$$W_R = \frac{mg a_1}{l} \quad \text{--- (2)}$$

Substituting (2) in (1)

$$W_f = mg - mg \frac{a_1}{l}$$

$$W_f = mg \left(1 - \frac{a_1}{l} \right)$$

$$W_f = 1765 \times 9.81 \left(1 - \frac{1.22}{2.84} \right)$$

$$W_f = 9886.67 \text{ N}$$

$$W_R = 7427.98 \text{ N}$$

⇒ Q.3

Diff. parts of Tyre are

① Bead - Bead is a spring wire which holds the tyre against rim
Dia of bead $<$ Dia. of rim

It is constructed in similar way to clutch wire

② Bead filler - It is used to protect rubber from bead wire

③ Innerliner - It is a softer rubber on inner side of tyre

It prevents tyre air from leaking out

It is used in Radial tyre

④ Body Ply - Soft rubber compound with reinforcement like Nylon, Kevlar, Carbon Fibre etc

Provides strength to tyre

⑤ Shoulder insert - To reinforce shoulder

⑥ Steel belt - To reinforce tread

Based on construction, tyres are of two types

- ① Radial
- ② Bias Ply