

Assignment

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Power Train Calculation

① Aerodynamic resistance (R_a)

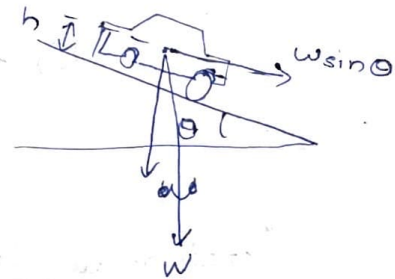
$$R_a = \frac{1}{2} \rho C_d A v^2$$

h - height of C.G

② Gravitational Resistance / Gradient Resistance (R_g)

$$R_g = W \sin \theta$$

θ - inclination / gradient angle.



when $\theta = 90^\circ$ max

when $\theta = 0^\circ$ min = angular acceleration force

$$F = \frac{16^2 a}{8^2 \eta_a}$$

③ Rolling Resistance (R_R)

$$R_R = \underbrace{R_{Rf}}_{\text{front}} + \underbrace{R_{Rr}}_{\text{rear}}$$

$$R_{Rr} = \alpha \cdot R_{Rf}$$

④ Traction Force (F_T)

$$F_T = F_{Tf} + F_{TR} \rightarrow \text{AWD / 4WP / 4x4}$$

40% 60% 100%

$$0.4 F_T \quad 0.6 F_T$$

front wheel drive $\rightarrow F_T = F_{Tf}$

rear wheel drive $\rightarrow F_T = F_{TR}$

$$F_T - (R_a + R_r + R_g) = m \times a$$

~~$$F_T - (R_a + R_r + R_g) = m \times a$$~~

$$F_T = \underbrace{m a}_{\text{acceleration resistance}} + \underbrace{R_a + R_r + R_g}_{\text{resistive forces}}$$

resistive forces.

acceleration resistance

Gradeability

Gradeability is measured either in degrees or percentage. Gradeability is dependent on engine power, drive train type, gear ratio, weight, weight distribution, car's centre of gravity and traction.

$$F = mg \times \sin \theta$$

$$\text{Total power} = \text{Total force} \times \text{speed}$$

$$\tan \theta \times 100 = \text{gradeability}$$

$$2Q) \quad m = 1765 \text{ kg} \quad l = 2.84 \text{ m} \quad a_1 = 1.22 \text{ m} \quad a_2 = 1.62 \text{ m}$$

$$F_{\text{axle}} = \frac{1}{2} mg \left(\frac{a_2}{l} \right)$$

$$= \frac{1}{2} \times 1765 \times 9.8 \times \frac{1.62}{2.84}$$

$$= \underline{\underline{9866.59 \text{ N}}}$$

$$F_{Z_{\text{axle}}} = \frac{1}{2} mg \left(\frac{a_1}{e} \right)$$

$$= \frac{1}{2} \times 1765 \times 9.8 \times \frac{1.22}{2.84}$$

$$= \underline{\underline{7430.40 \text{ N}}}$$

30)

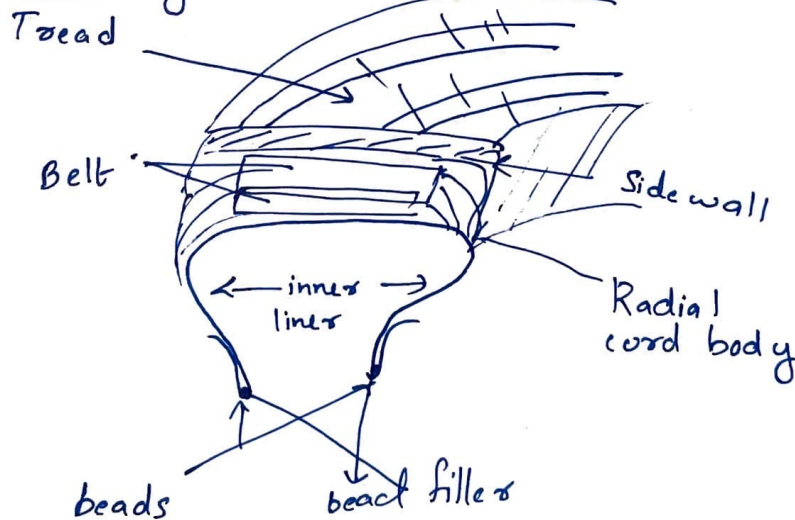
Type classification

Based on construction

(i) Radial

(ii) Bias

Different parts of Tyre



Beads - They are made of copper, brass or bronze-plated high tensile steel wires

Bead Filler - Bead filler is compound inside the tire beads. It provides stability to lower side and bead areas.

Radial cord Body :- It gives strength and transmits
converging forces from the tread to wheel.

Inner liner :- It retains air pressure.

Belt Plies :- They are two or more strong layers of cord
just under the tread area of tire. They improve
tire mileage, impact resistance and traction. Steel is most
commonly used.