Braking calculations ⌦ (FA U/M) | FRONT | ①

→ Assumptions :- · Car weight → W → 250 kg → 550 lb
· $a_x = 1.6 g$

((Const.
were approx.) · H (road & tire) = 1.6
· Center of gravity (COG) $\overset{(h)}{\Rightarrow}$ 320 mm ⇒ 12.6 in
(w engine)

· $\mu_{pad} = 0.42$
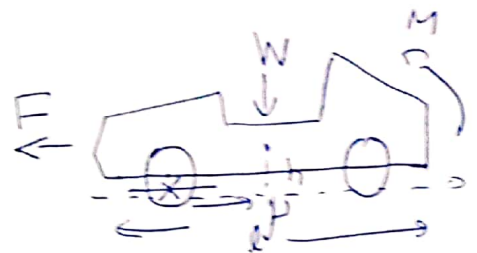· Length (l) ⇒ 2300 mm ⇒ 90.5 in

· Brake bias (b) ⇒ 0.5
· Pedal ratio (PR) = 2.48
· Rotor radius (r_{rotor}) = 5 in

2) **Total weight transfer in X-direction**

∴ $\Delta W_x = \dfrac{h}{l} \times W \times a_x$

$= \dfrac{320}{2300} \times 250 \times 1.6$

$$\boxed{|\Delta W_x = 55.652 \text{ kg}} \Rightarrow |122.51933 \text{ lb}|$$

2) **Weight that must be stopped by front wheels**

$W_{tf} = \Delta W_x + \dfrac{W}{2}$

$= 55.652 + \dfrac{250}{2}$

$$\boxed{|W_{tf} = 180.652 \text{ kg}} \Rightarrow |247.51933 \text{ lbf}|$$

2) **Front wheel locking torque required**

→ Tire radius (r) = 10 in = 254 mm = 0.154 m

$T_{front} = r \times W_{tf} \times \mu_{tire}$ = $0.254 \times 100.652 \times 1.6$

$\boxed{T_{front} = 3910.304 \text{ lb.in}}$ ⇒ $\boxed{T_{front} = 94.512165 \text{ N-m}}$

Torque per front wheel :- $\mathcal{T}_{fpw} = \dfrac{3960.309}{2}$, $\cancel{14.5\text{.}1765}$ ②

$$\therefore \boxed{\mathcal{T}_{pw} = 1980.1546 \text{ lb-in} = 22.\text{Q}86\text{R}2\text{R W-m}}$$

MASTER CYLINDER AND PISTON

⇒ Master cylinder bore $(MC_{bore}) = 0.625$ in

⇒ $MC_{area} = \dfrac{\pi \times (MC_{bore})^2}{4} = 0.31$ in²

⇒ Piston diameter $(D_p) = 0.48$ in

⇒ No. of pistons $(N) = 4$ per caliper

⇒ Piston area $(A_p) = \dfrac{\pi D_p^2}{4} \times N$

$$\boxed{A_p = 3.04 \text{ in}^2}$$

⇒ Force req.d by driver to lock wheels

$$F_{driver} = \left[\dfrac{\left(\dfrac{\mathcal{T}_{fpw}}{MC_{bore\ front}} \right)}{(2 \times r_{rotor} \times \mu_{pad} \times A_{piston})} \right]$$

$$\div (PR \times b)$$

$$= \dfrac{1980.1546}{\dfrac{0.625}{\dfrac{2 \times 8 \times 0.42 \times 3.04}{2.48 \times 0.5}}}$$

| WILL CHANGE |
| DEPENDING ON |
| PR and b and piston |

[5 inch rotor]

⇒ $\boxed{F_{driver} = 307.693 \text{ lb}}$

→ $\boxed{F_{driver} = 192.300 \text{ lb}}$

[8 inch rotor]

<u>Line pressure</u> ⇒ $P_{front} = (F_{driver} \cdot PL' \cdot b) / MC_{arm}$

$$= \frac{192.308 \times 2.08 \times 0.5}{0.31}$$

$P_{front} = 769.232$ psi

<u>Spnis</u> :- ISR- 22-048 (front wheels) ⎫
　　　　　ISR 22-064 (rear)　　　　　⎬ Callipers
　　　　　　　　　　　　　　　　　　　⎭

　　　　Tilton 78 (pivoting type)
　　　　↳ $5/8''$ front (bore)
　　　　↳ $1''$ rear (bore)