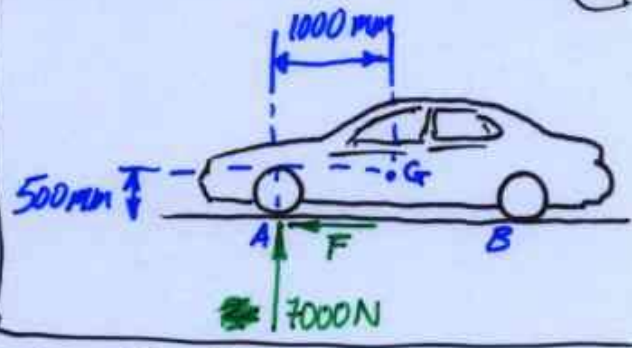


Q. 2/71

(6#)

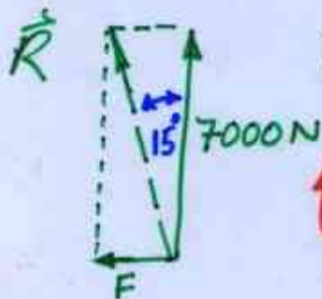
## 2D Problem

FRONT WHEELS EXPERIENCE COMBINED REACTION OF 7000N plus friction  $\vec{F}$ . Both from ROAD.



Resultant makes  $15^\circ$  angle to vertical  
find EQUIVALENT FORCE-COUPLE SYSTEM @ G

### I/ Easiest way



$$\vec{R} = -F\hat{i} + 7000\hat{j}$$

BASIC trig:

$$\|\vec{R}\| = 7000 / \cos(15^\circ) = 7000 / 0.966 = \underline{7247 \text{ N}}$$

$$\|\vec{F}\| = (7000)(\tan 15^\circ) = (7000)(0.268) = \underline{1876 \text{ N}}$$

Moment of  $\vec{R}$  about G =  $\Sigma$  moments of components

$$M_G = (-7000)(1.0) + (-1876)(0.5)$$

$$= -7000 - 938 = \underline{-7938 \text{ Nm}} \text{ i.e. } \underline{7938 \text{ Nm CW}}$$

So force-couple @ G =  $-1876\hat{i} + 7000\hat{j}$  force AND  $-7938 \text{ Nm}$  couple

### II/ Calculate moment differently:

$$M = Rd$$

$$d_2 = 1.0 / \cos(15^\circ) = 1.0 / 0.966 = \underline{1.035}$$

$$d_1 = (L) \sin(15^\circ)$$

$$L = 0.5 - (1.0)(\tan 15^\circ)$$

$$d_1 = (0.5 - 0.268)(0.259) = \underline{0.06}$$

$$d = 1.035 + 0.06 = \underline{1.095}$$

$$M = (1.095)(7247) = \underline{7935 \text{ Nm}} \text{ [C.W.]}$$

