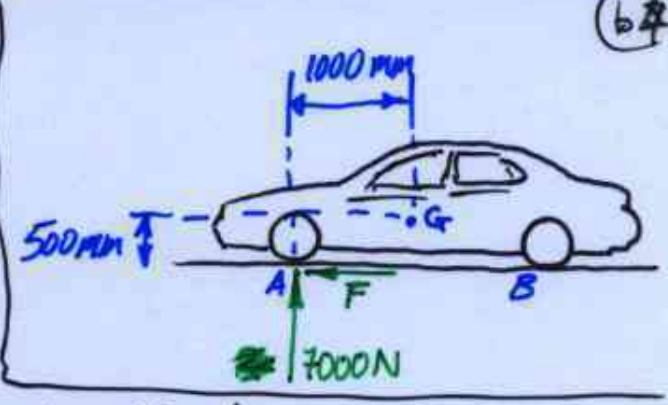


Q. 2/7

(64)

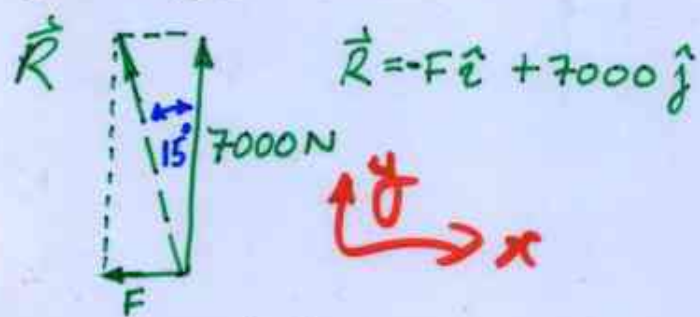
2D Problem

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



Resultant makes 15° angle to vertical
 FIND EQUIVALENT FORCE-COUPLE SYSTEM @ G

I/ Easiest way



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

BASIC TRIG:

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

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

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

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

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

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

II/ Calculate moment differently:

$$M = Rd$$

$$R = 7247 \text{ N}$$

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

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

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

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

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

$$M = (1.095) \times (7247) = 7935 \text{ Nm } \boxed{\text{C.W.}}$$

