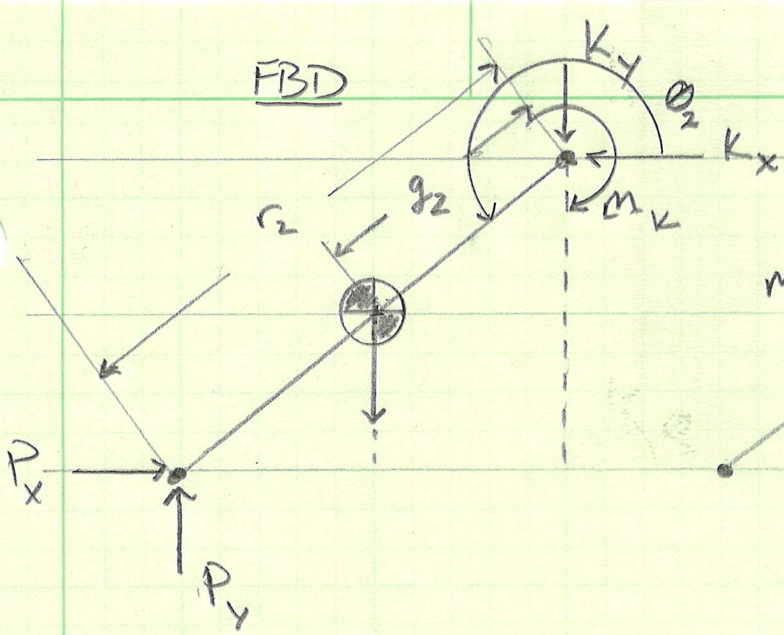

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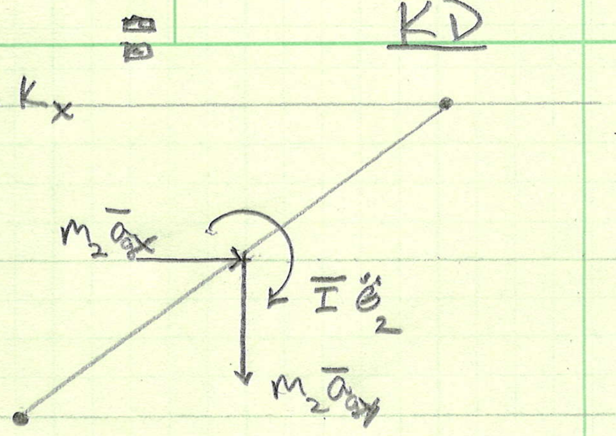

$$\vec{r}_{P/C} = \langle r_3 c_3,\ r_3 s_3,\ 0\rangle \ m$$

$$\vec{r}_{G/P} = \langle (r_2-g_2)c_2,\ (r_2-g_2)s_2,\ 0\rangle \ m$$

Acceleration Analysis

$$\vec{a}_P = \cancel{\vec{a}_C}^{\,0} + \vec{a}_{P/C}$$

$$= \ddot{\theta}_3 \times \vec{r}_{P/C} + \dot{\theta}_3 \times (\dot{\theta}_3 \times \vec{r}_{P/C})$$

$$= \boxed{\langle -c_3 r_3 \dot{\theta}_3^2,\ -r_3 s_3 \dot{\theta}_3^2,\ 0\rangle \ \tfrac{m}{s^2}}$$

$$\vec{a}_G = \vec{a}_P + \vec{a}_{G/P}$$

$$= \langle -c_3 r_3 \dot{\theta}_3^2,\ -r_3 s_3 \dot{\theta}_3^2,\ 0\rangle \tfrac{m}{s^2} + \ddot{\theta}_2 \times \vec{r}_{G/P} + \dot{\theta}_2 \times (\dot{\theta}_2 \times \vec{r}_{G/P})$$

$$= \boxed{\begin{array}{l}\langle c_2(g_2-r_2)\dot{\theta}_2^2 - c_3 r_3 \dot{\theta}_3^2 + s_2\ddot{\theta}_2(g_2-r_2),\ s_2(g_2-r_2)\dot{\theta}_2^2 - r_3 s_3 \dot{\theta}_3^2 - \ldots \\ \qquad \ldots - c_2\ddot{\theta}_2(g_2-r_2),\ 0\rangle \ m/s^2\end{array}}$$

EQUILIBRIUM

$\xrightarrow{+} \sum F_x: \; P_x - K_x = m_s \bar{a}_{2g_x}$

$+\uparrow \sum F_y: \; P_y - K_y - m_s \vec{a}_g = m_s \bar{a}_{2g_y}$

$\circlearrowleft + \sum M_G: \; K_x(g_2 S_2) - K_y(g_2 C_2) - M_K + P_x(r_2 - g_2)(S_2) - P_y(r_2 - g_2)(C_2) = \ldots$

$\ldots = \bar{I}_{G2} \ddot{\theta}_2$

$\therefore \; A\vec{x} = \vec{b}:$

$$
\underbrace{\begin{bmatrix} -1 & 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 & 1 \\ g_2 S_2 & -g_2 C_2 & -1 & S_2(r_2 - g_2) & -C_2(r_2 - g_2) \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}}_{A}
\underbrace{\begin{bmatrix} K_x \\ K_y \\ M_K \\ P_x \\ P_y \end{bmatrix}}_{\vec{x}}
=
\underbrace{\begin{bmatrix} m_s \bar{a}_{Gx_2} \\ m_s(-\bar{a}_{Gy_2} + \vec{a}_g) \\ -\bar{I}_{G_2} \ddot{\theta}_2 \\ -90 \sin(\theta_3 + 1.5708) - 30N \\ 160 \sin(\theta_3 - 0.5236) + 160N \end{bmatrix}}_{\vec{b}}
$$