RO2102: Dynamics and Simulation

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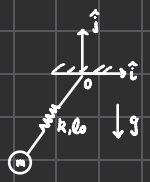
Homework-3

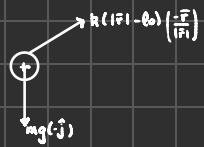
Problem 6 **Due : 28 - Jan - 2025** **Time Spent : 1 Hour 15 Min**



Given : $m, g, k, l_0, \bar{r}_0, \bar{v}_0$

To Find : Equations of motion

FBD: Mass



Apply LMB,

$$\sum \bar{F} = \dot{\bar{L}}$$

$$\Rightarrow k(|\bar{r}|-l_0)\left(\frac{-\bar{r}}{|\bar{r}|}\right) - mg\hat{j} = m\bar{a}$$

$$\Rightarrow \boxed{\ddot{\bar{r}} = \frac{-k(|\bar{r}|-l_0)\bar{r}}{m|\bar{r}|} - g\hat{j}}$$

(c) (i) $k = 0$

(ii) $x_0 = 0$, $v_{x0} = 0$

(iii) $g = 0$, $\bar{v}_0 = \bar{0}$

(iv) $l_0 = 0$: In this case for any $\bar{r}_0 \neq \bar{0}$ and $\bar{v}_0 \neq 0$, motion is observed.

(v) $|\bar{r}_0| = l_0$; $\bar{v}_0 = \bar{0}$

(vi) $|\bar{r}_0| = l_0$; $\bar{v}_0 \neq \bar{0}$