Kevin Chu 10705908

Exercícios da Aula 17/09

1) Linearização de $f(x) = \cos x$

a) $\bar{x} = 0$: $\quad f(x) \cong f(\bar{x}) + \frac{\partial f}{\partial x}\Big|_{x=\bar{x}}(x-\bar{x}) \cong \cos\bar{x} - \text{sen}\,\bar{x}\,(x-\bar{x})$

$f(x) = \cos 0 - \text{sen}\,0\,(x-0) = 1 \Rightarrow \boxed{f(x) \cong 1}$

b) $\bar{x} = \frac{\pi}{4}$: $\quad f(x) = \cos\bar{x} - \text{sen}\,\bar{x}\,(x-\bar{x})$

$f(x) = \cos\frac{\pi}{4} - \text{sen}\frac{\pi}{4}\left(x-\frac{\pi}{4}\right) \Rightarrow \boxed{f(x) \cong \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\left(x-\frac{\pi}{4}\right)}$

2) Linearização de $m\dot{v} = F(t) - mru + mx\dot{r}$ por expansão em série de Taylor em torno de $\dot{v} = \bar{r} = \dot{r} = 0$

$f(x, u, r, \dot{r}, \dot{v}) = f(\bar{x}, \bar{u}, \bar{r}, \dot{\bar{r}}, \dot{\bar{v}}) + \frac{\partial f}{\partial x}\Big|_{x=\bar{x}}(x-\bar{x}) + \frac{\partial f}{\partial u}\Big|_{u=\bar{u}}(u-\bar{u}) + \frac{\partial f}{\partial r}\Big|_{r=\bar{r}}(r-\bar{r}) +$

$+ \frac{\partial f}{\partial \dot{r}}\Big|_{\dot{r}=\dot{\bar{r}}}(\dot{r}-\dot{\bar{r}}) + \frac{\partial f}{\partial \dot{v}}\Big|_{\dot{v}=\dot{\bar{v}}}(\dot{v}-\dot{\bar{v}})$

$f(x, u, r, \dot{r}, \dot{v}) = 0 + m\dot{\bar{r}}(x-\bar{x}) - m\bar{r}(u-\bar{u}) - m\bar{u}(r-\bar{r}) + m\bar{x}(\dot{r}-\dot{\bar{r}}) - m(\dot{v}-\dot{\bar{v}})$

$-F(t) = -m\bar{u}r + m\bar{x}\dot{r} - m\dot{v}$

$\boxed{m\dot{v} = F(t) - m\bar{u}r + m\bar{x}\dot{r}}$