

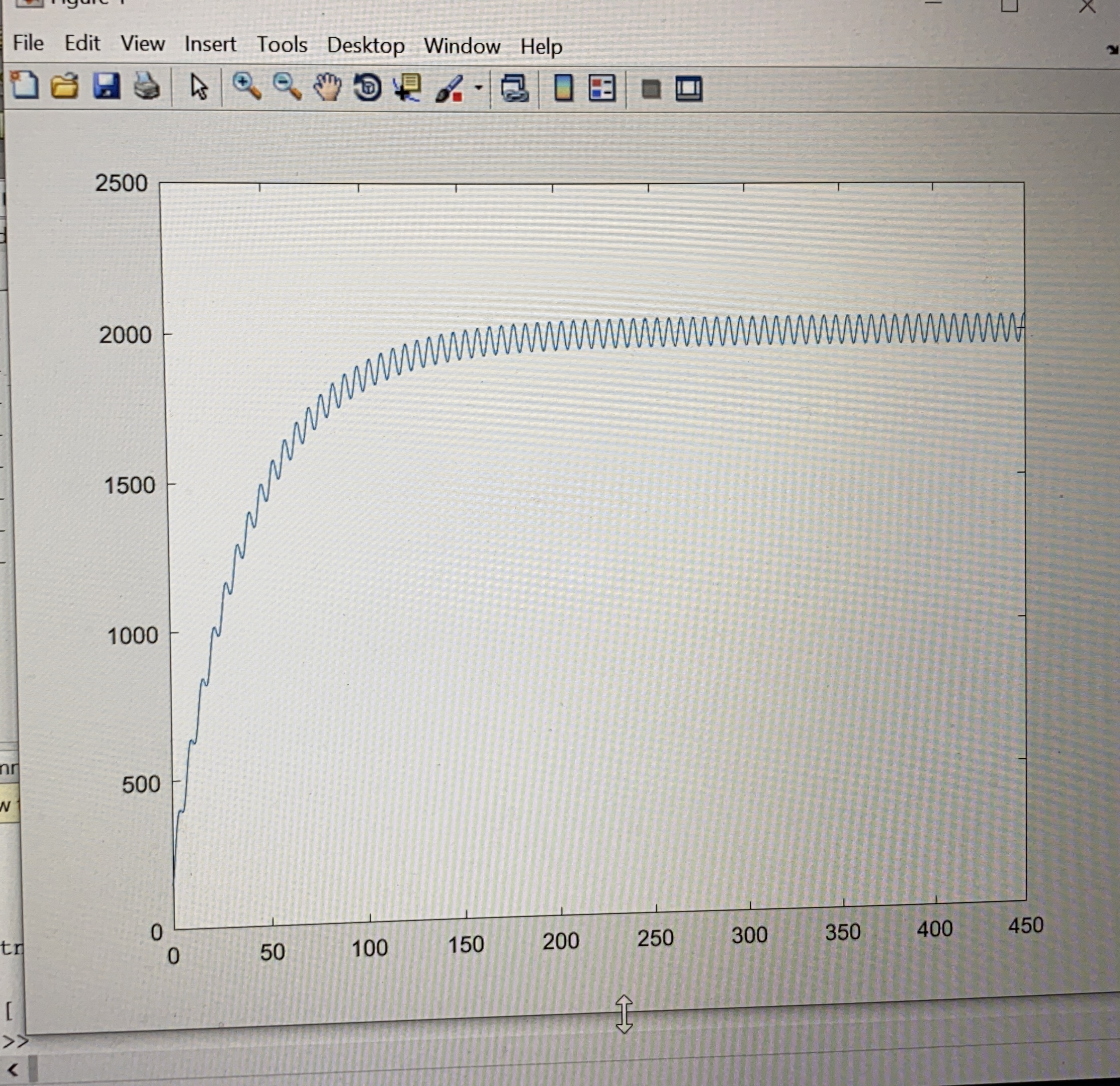
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DEPT :- MECHANICAL ENGINEERING

DATE :- 6/05/2020

ASS V

(1)  $dm = m \ln - m_{out}$

$$\frac{dm}{dt} = 50 (1 + \sin t) - \frac{30}{1200} m$$

$$\frac{dm}{dt} + \frac{1}{40} m = 50 (1 + \sin t)$$

$$\frac{dy}{dx} + py = q$$

$$I.F. = e^{\int p dx}$$

$$p = \frac{1}{40}$$

$$\int p dx = \int \frac{1}{40} dt$$

$$I.F. = e^{\int \frac{1}{40} dt} = e^{\frac{1}{40} t}$$

$$m \cdot e^{\frac{1}{40} t} = 50 \int (1 + \sin t) e^{\frac{1}{40} t}$$

$$\Rightarrow \int \sin t e^{\frac{1}{40} t}$$

$$\therefore u = \sin t \quad \text{and} \quad dv = e^{\frac{1}{40} t}$$

$$d \left( \int u dv \right) = \int u dv + v du$$

$$\text{and by } \int u dv = uv - \int v du$$

$$= 40 \sin t e^{\frac{1}{40} t} - 40 \left[ (1 + \cos t) (40 e^{\frac{1}{40} t}) + \int 40 e^{\frac{1}{40} t} \right]$$

(cont)

$$\dot{I} = C \sin t (40 e^{1/40 t}) - 40 [\cos t (40 e^{1/40 t})] - 160 I$$

$$160 I = C \sin t (40 e^{1/40 t}) - 16000 e^{1/40 t} \cos t$$

$$50 I = \frac{50 C \sin t (40 e^{1/40 t}) - 80000 e^{1/40 t} \cos t}{160}$$

$$\text{so } \int e^{1/40 t} = 2000 e^{1/40 t}$$

$$m \cdot e^{1/40 t} = 2000 e^{1/40 t} + 50 I$$

$$m = 2000 + \frac{50 I}{e^{1/40 t}}$$

$$m = 2000 + \frac{80000}{160} + B$$

at  $t=0$ ;

$$m = 2000 + \frac{2000 C \sin t}{160} = \frac{80000 \cos t}{160} - \frac{18000.03}{e^{1/40 t}}$$

$$\Rightarrow m = \frac{80000 \cos t}{160} - \frac{18000.03}{e^{1/40 t}}$$