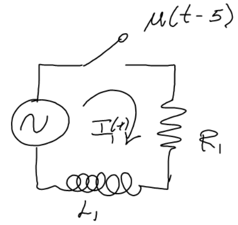

$$\boxed{I_1(0)=0}$$

$$L_1\frac{dI_1}{dt}+R_1I_1=u(t-5)\cdot 120\,\text{sen}\left(60\left(2\pi t\right)\right)$$

$$L_1\mathcal{L}\left\{\frac{dI_1}{dt}\right\}+R_1\mathcal{L}\{I_1\}=120\,\mathcal{L}\left\{u(t-5)\,\text{sen}\left(120\pi t\right)\right\}$$

$$L_1\left(s\mathcal{L}\{I_1\}-\cancel{I_1(0)}\right)+R_1\mathcal{L}\{I_1\}=\frac{120e^{-5s}}{s^2+(120\pi)^2}$$

$$\left(s+\frac{R_1}{L_1}\right)\mathcal{L}\{I_1\}=\frac{120}{L_1}\left(\frac{e^{-5s}}{s^2+14400\pi^2}\right)$$

$$\mathcal{L}\{I_1\}=\left(\frac{\frac{120}{L_1}e^{-5s}}{\left(s+\frac{R_1}{L_1}\right)\left(s^2+14400\pi^2\right)}\right)$$

$$=\frac{A}{s+\frac{R_1}{L_1}}+\frac{Bs+D}{s^2+14.400\pi^2}$$

$$\frac{120}{L_1}e^{-5s}=\left(Bs+D\right)\left(s+\frac{R_1}{L_1}\right)+A\left(s^2+14.400\pi^2\right)$$

$$=Bs^2+\left(\frac{R_1}{L_1}B+D\right)s+\frac{R_1}{L_1}D+As^2+A\cdot 14400\pi^2$$

$$=(A+B)s^2+\left(\frac{R_1}{L_1}B+D\right)s+\left(\frac{R_1D}{L_1}+A\,14400\pi^2\right)$$

$$\boxed{\begin{aligned}&A+B=0\\&\frac{R_1}{L_1}B+D=0\\&\frac{R_1D}{L_1}+A\,14400\pi^2=\frac{120}{L_1}e^{-5s}\end{aligned}}$$

$$\frac{R_1B}{L_1}+D=0 \qquad D=-\frac{R_1}{L_1}B$$

$$\frac{R_1D}{L_1}-B\,14400\pi^2=\frac{120}{L_1}e^{-5s}$$

$$\frac{R_1}{L_1}\left(-\frac{R_1}{L_1}B\right)-B\,14400\pi^2=\frac{120}{L_1}e^{-5s}$$

$$-B\left(\frac{R_1^2}{L_1^2}+14400\pi^2\right)=\frac{120}{L_1}e^{-5s}$$

$$\boxed{B=-\frac{\frac{120}{L_1}e^{-5s}}{\frac{R_1^2}{L_1^2}+14400\pi^2}} \qquad \boxed{A=\frac{\frac{120}{L_1}e^{-5s}}{\frac{R_1^2}{L_1^2}+14400\pi^2}}$$

$$\boxed{D=+\frac{R_1}{L_1}\left(\frac{\frac{120}{L_1}e^{-5s}}{\frac{R_1^2}{L_1^2}+14400\pi^2}\right)}$$

$$I_1(t) = A\mathcal{L}^{-1}\left\{\frac{1}{s+\frac{R_1}{L_1}}\right\} +$$

$$+ B\mathcal{L}^{-1}\left\{\frac{s}{s^2+(120\pi)^2}\right\} +$$

$$+ \frac{D}{120\pi}\mathcal{L}^{-1}\left\{\frac{120\pi}{s^2+(120\pi)^2}\right\}$$

$$\boxed{I_1(t) = Ae^{-\frac{R_1}{L_1}t} + B\cos(120\pi t) + \frac{D}{120\pi}\operatorname{sen}(120\pi t)}$$

$$\frac{d}{dt}\bar{x} = A\bar{x} \qquad \bar{x} = \begin{bmatrix} x_1(t) \\ x_2(t) \\ x_3(t) \end{bmatrix}$$

$$\bar{x} = \left[e^{At}\right]\bar{x}(0). \qquad \bar{x}(0) = \begin{bmatrix} 2 \\ -5 \\ 4 \end{bmatrix}$$

$$\mathcal{L}\left\{\frac{d}{dt}\bar{x}\right\} = A\mathcal{L}\{\bar{x}\}$$

$$s\mathcal{L}\{\bar{x}\} - \bar{x}(0) = A\mathcal{L}\{\bar{x}\}$$

$$s\mathcal{L}\{\bar{x}\} - A\mathcal{L}\{\bar{x}\} = \bar{x}(0)$$

$$(sI - A)\mathcal{L}\{\bar{x}\} = \bar{x}(0)$$

$$\underbrace{(sI-A)^{-1}(sI-A)}_{I}\mathcal{L}\{\bar{x}\} = (sI-A)^{-1}\bar{x}(0)$$

$$\mathcal{L}\{\bar{x}\} = (sI-A)^{-1}\bar{x}(0)$$

$$\bar{x} = \mathcal{L}^{-1}\left\{(sI-A)^{-1}\right\}\bar{x}(0)$$

$$\boxed{e^{A(t)} = \mathcal{L}^{-1}\left\{(sI-A)^{-1}\right\}}$$

$$A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \qquad I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$sI - A = s\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

$$(sI - A) = \begin{bmatrix} s-2 & -3 \\ -1 & s-4 \end{bmatrix}$$

$$(sI - A)^{-1} = \frac{\begin{bmatrix} s-4 & 3 \\ 1 & s-2 \end{bmatrix}}{(s-2)(s-4)-3}$$

$$(sI - A)^{-1} = \frac{\begin{bmatrix} s-4 & 3 \\ 1 & s-2 \end{bmatrix}}{s^2-6s+5} \Rightarrow \frac{\begin{bmatrix} s-4 & 3 \\ 1 & s-2 \end{bmatrix}}{(s-1)(s-5)}$$

$$(sI - A)^{-1} = \begin{bmatrix} \frac{s-4}{(s-1)(s-5)} & \frac{3}{(s-1)(s-5)} \\ \frac{1}{(s-1)(s-5)} & \frac{s-2}{(s-1)(s-5)} \end{bmatrix}$$

$$\frac{s-4}{(s-1)(s-5)} = \frac{A}{s-1} + \frac{B}{s-5}$$

$$s-4 = A(s-5) + B(s-1)$$

Si $s=1$

$$1-4 = -4A + (0)$$

$$\boxed{A = \frac{3}{4}}$$

Si $s=5$

$$5-4 = B(4)$$

$$\boxed{B = \frac{1}{4}}$$

$$s-2 = D(s-5) + E(s-1)$$

Si $s=1$

$$1-2 = -4D$$

$$D = \frac{1}{4}$$

Si $s=5$

$$5-2 = E(4)$$

$$E = \frac{3}{4}$$

$$3 = AA(s-5) + BB(s-1)$$

Si $s=1$

$$3 = AA(-4) \quad AA = -\frac{3}{4}$$

Si $s=5$

$$3 = BB(4) \quad BB = \frac{3}{4}$$

$$(sI-A)^{-1} = \begin{bmatrix} \frac{3}{4}\cdot\frac{1}{s-1}+\frac{1}{4}\cdot\frac{1}{s-5} & -\frac{3}{4}\frac{1}{s-1}+\frac{3}{4}\frac{1}{s-5} \\ -\frac{1}{4}\frac{1}{s-1}+\frac{1}{4}\frac{1}{s-5} & \frac{1}{4}\cdot\frac{1}{s-1}+\frac{3}{4}\cdot\frac{1}{s-5} \end{bmatrix}$$

$$e^{At} = \mathcal{L}^{-1}\left\{(sI-A)^{-1}\right\} = \begin{bmatrix} \frac{3}{4} & -\frac{3}{4} \\ -\frac{1}{4} & \frac{1}{4} \end{bmatrix} \mathcal{L}^{-1}\left\{\frac{1}{s-1}\right\} +$$

$$+ \begin{bmatrix} \frac{1}{4} & \frac{3}{4} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix} \mathcal{L}^{-1}\left\{\frac{1}{s-5}\right\}$$

$$\boxed{e^{At} = \begin{bmatrix} 3 & -3 \\ -1 & 1 \end{bmatrix} \frac{e^{t}}{4} + \begin{bmatrix} 1 & 3 \\ 1 & 3 \end{bmatrix} \frac{e^{5t}}{4}}$$