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Elect/Elect

$$\frac{d^2x}{dt^2} + \frac{5dx}{dt} + 6x = \cos t$$

$$m^2 + 5m + 6$$

$$m + 5m + 6$$

$$(m+2)(m+3)$$

$$m_1 = -2, m_2 = -3$$

$$\text{C.F. : } y = Ae^{-2x} + Be^{-3x}$$

$$\text{P.I. } \Rightarrow y = (C \cos t + D \sin t)$$

$$\frac{dy}{dt} = -(C \sin t + D \cos t)$$

$$\frac{d^2y}{dt^2} = -(C \cos t - D \sin t)$$

Substitute  $\frac{dy}{dt}$  and  $\frac{d^2y}{dt^2}$  into ~~eqn~~ <sup>eqn</sup>

$$[-(C \cos t - D \sin t)] + 5[C \sin t + D \cos t] + 6[C \cos t + D \sin t] = \cos t$$

$$-(C \cos t - D \sin t) - 5(C \sin t + D \cos t) + 6C \cos t + 6D \sin t - C \cos t$$

$$C \cos t [-C + 5C + 6C] + \sin t [-D - 5C + 6D] = \cos t$$

$$C \cos t [8C + 5C] - \sin t [-5C + 5D] = \cos t$$

Compare

$$\text{Cost} = 5D + 3C = 1$$

$$\text{Sint} = 5C + 6D = 0$$

$$\text{Cost} \quad 5D + 3C = 1 \quad \dots \quad (1)$$

$$5D - 3C = 0 \quad \dots \quad (2)$$

Solving simultaneously

$$5D + 3C = 1$$

$$5D - 3C = 0$$

$$\hline 10D = 1$$

$$10D = 1$$

$$D = \frac{1}{10}$$

Input  $D = \frac{1}{10}$  in eqn (2)

$$5D - 3C = 0$$

$$5\left(\frac{1}{10}\right) - 3C = 0$$

$$\frac{1}{2} - 3C = 0$$

$$3C = \frac{1}{2}$$

$$C = \frac{1}{2} \div 3$$

$$C = \frac{1}{6}$$

$$C = \frac{1}{6} \quad D = \frac{1}{10} \quad \text{P.I. } \frac{1}{10} \cos t + \frac{1}{10} \sin t$$

$$\text{recall } x = C \cdot F + P \cdot I$$

$$\cancel{C \cdot F + P \cdot I}$$

$$x = Ae^{-2t} + Be^{-3t} + \frac{1}{10} \cos t + \frac{1}{10} \sin t$$

$$x = \left(\frac{1}{10}\right)^{-3t} + \left(\frac{1}{10}\right)^{-2t} + \frac{1}{10} (\cos t + \sin t)$$

x =

$$\exp(-3*t)/10 - \exp(-2*t) + \cos(t) + \sin(t)$$

tn =

0  
0.0100  
15.0000

xn =

$$\begin{aligned} & \cos(1/100) - \exp(-1/50) + \exp(-3/100)/10 + \sin(1/100) \\ & \cos(15) - \exp(-30) + \exp(-45)/10 + \sin(15) \end{aligned}$$

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COMMMANDS

```
commandwindow
clear
clc
close all
syms t
x = 0.1*(exp(-3*t))-exp(-2*t)+cos(t)+sin(t)
tn = [0;0.01;15]
xn = subs(x,tn)
figure (1)
plot(tn,xn)
grid on
grid minor
axis tight
xlabel ('t')
ylabel ('x')
```

