

AKÉrele Uzumizi E

16/MH501/021

Computer Engineering

ENG 381

Assignment

$$1.) \frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = \cos t$$

$$\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 0$$

$$C.F = m^2 + 5m + 6 = 0$$

$$m^2 + 3m + 2m + 6 = 0$$

$$m(m+3) + 2(m+3) = 0$$

$$(m+3)(m+2) = 0$$

$$m_1 = -3 \text{ and } m_2 = -2$$

$$x = Ae^{-3t} + Be^{-2t} = C.F$$

$$P.F f(x) = \cos t$$

$$x = A \cos t + B \sin t$$

$$\frac{dx}{dt} = -A \sin t + B \cos t$$

dt

$$\frac{d^2x}{dt^2} = -A \cos t - B \sin t$$

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

$$\begin{aligned} & (-A \cos t - B \sin t) + (-5A \sin t + 5B \cos t) + (6A \cos t + 6B \sin t) \\ & = \cos t \quad (A \cos t + 6A \cos t - B \sin t - 5A \sin t + 5B \cos t + 6B \sin t) = \\ & \cos t \quad 5A \cos t + 5B \sin t + 5B \cos t = \cos t \quad 5A \cos t + \\ & 5B \sin t + 5B \cos t = \cos t \end{aligned}$$

Comparing and collecting like forms

$$5A + 5B = 1$$

$$-5A + 5B = 0$$

$$5B = 1$$

$$B = \frac{1}{5}$$

$$5A + 5B = 1$$

$$5A + 5\left(\frac{1}{5}\right) = 1$$

$$5A + \frac{1}{1} = 1$$

$$5A = 1 - \frac{1}{1}$$

$$5A = 0$$

$$A = 0$$

$$\begin{aligned} \therefore \text{P.I} &\Rightarrow \frac{1}{5} \cos t + \frac{1}{5} \sin t \\ &= \frac{1}{5} (\cos t + \sin t) \end{aligned}$$

Recall, $x = \text{c.f} + \text{P.I}$

$$x = Ae^{-3t} + B^{-2t} + \frac{1}{5} (\cos t + \sin t)$$

$$x = \left(\frac{1}{5}\right)^{-3t} + \left(\frac{1}{5}\right)^{-2t} + \frac{1}{5} (\cos t + \sin t) //$$

x =

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

tn =

0
0.0100
15.0000

```
xn =
```

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

```
>>
```

```
COPMMANDS
```

```
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')
```

