

ROEGBU LAWRENCE PRINCE

16/ENG02/024

COMPUTER ENGINEERING

ENG 389 Assignment 1

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

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

$$x = Ae^{mt}$$

For C.F

$$m^2 + 5m + 6 = 0$$

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

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

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

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

$$x = Ae^{m_1 t} + Be^{m_2 t}$$

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

For P.I

$$x: f(x) = \cos t$$

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

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

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

$$= [-A \cos t - B \sin t] + [-5A \sin t + 5B \cos t] + [6A \cos t + 6B \sin t] =$$

$$[-A \cos t + 5A \cos t] + [-B \sin t + 6B \sin t] + [5A \sin t + 5B \cos t]$$

$$5A \cos t + 5B \sin t - 5A \sin t + 5B \cos t = \cos t$$

Collecting Co-efficients of Like terms

$$\Rightarrow 5A + 5B = 1 \text{ --- --- equ (1)}$$

$$-5A + 5B = 0 \text{ --- --- equ (2)}$$

$$10B = 1$$

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

$$\text{Put } B = \frac{1}{10} \text{ in equ (1)}$$

$$5A + 5\left[\frac{1}{10}\right] = 1$$

$$5A + \frac{1}{2} = 1$$

$$5A = 1 - \frac{1}{2}$$

$$5A = \frac{1}{2}$$

$$10A = 1$$

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

$$P.I = \frac{1}{10} \cos t + \frac{1}{10} \sin t$$

$$P.I = \frac{1}{10} (\cos t + \sin t)$$

General Solution

$$x = C.F + P.I$$

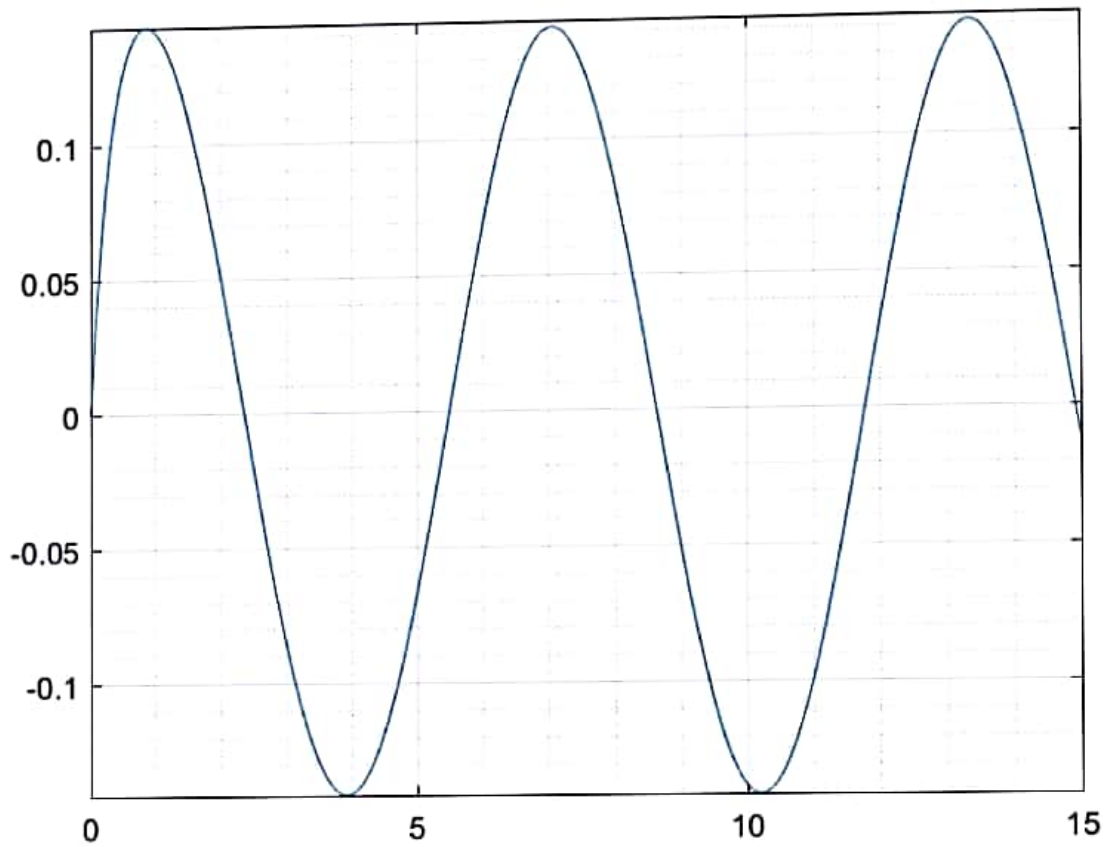
$$x = Ae^{-3t} + Be^{-2t} + \frac{1}{10} (\cos t + \sin t)$$

C.F

P.I

```
commandwindow
clear
clc
close all
syms t
x=-2*exp(-3*t)/10+exp(-2*t)/10+cos(t)/10+sin(t)/10
tn=[0;0.01;15]
xn=subs(x,tn)
plot(tn,xn)
xlabel('time')
ylabel('variable')
axis tight
grid on
grid minor
```

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