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16/ENG06/043
Mechanical Engineering
~~Assignment~~
ENG 381
300 Level

Assignment

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

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

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

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

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

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

$m_1 = -3$ and $m_2 = -2$

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

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

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

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

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

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

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

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

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

$=$

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

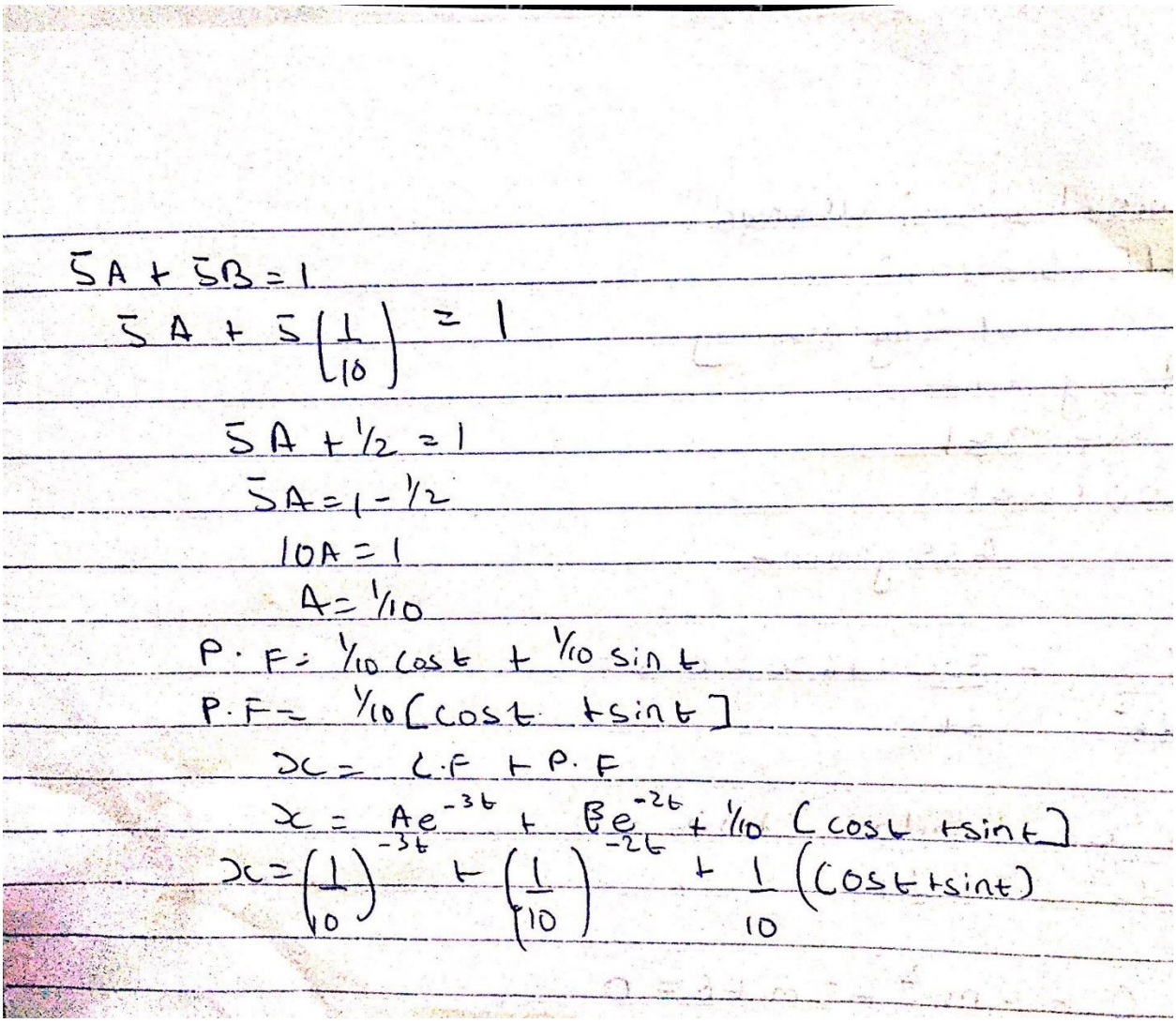
Collecting the co-efficients of like terms

$5A + 5B = 1$

$-5A + 5B = 0$

$10B = 1$

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




```
x =

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


tn =

         0
    0.0100
   15.0000


xn =

                                                          1/10
 cos(1/100) - exp(-1/50) + exp(-3/100)/10 + sin(1/100)
            cos(15) - exp(-30) + exp(-45)/10 + sin(15)
```

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>>

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')
```