Finbarrs-Ezema Bernard

16/ENG03/027

Civil Engineering

ENG 381

Assignment 3

1.)

Finbarrs-Ezema Bernard 20/11/18
16/ENG03/027
Civil Engineering
ENG 381
Assignment III

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

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

$m = -2$ or $m = -3$ (By factorization)

$y = Ae^{-2t} + Be^{-3t}$ (Complementary function)

$y = C\cos t + D\sin t$ (Particular Integral)

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

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

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

$-C + 5D + 6C = 1$

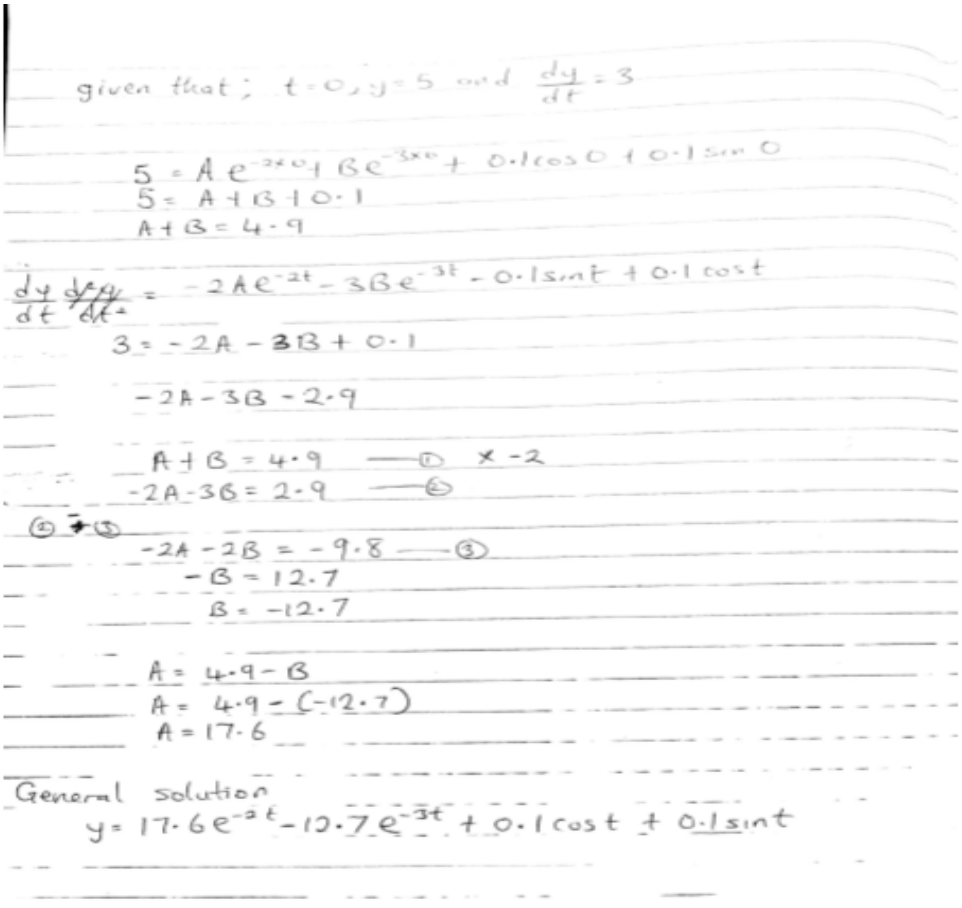
$-D - 5C + 6D = 0$

$5C + 5D = 1$ — (2)

$-5C + 5D = 0$ — (3)

$C = 1/10 \quad D = 1/10$

$y = Ae^{-2t} + Be^{-3t} + 0.1\cos t + 0.1\sin t$



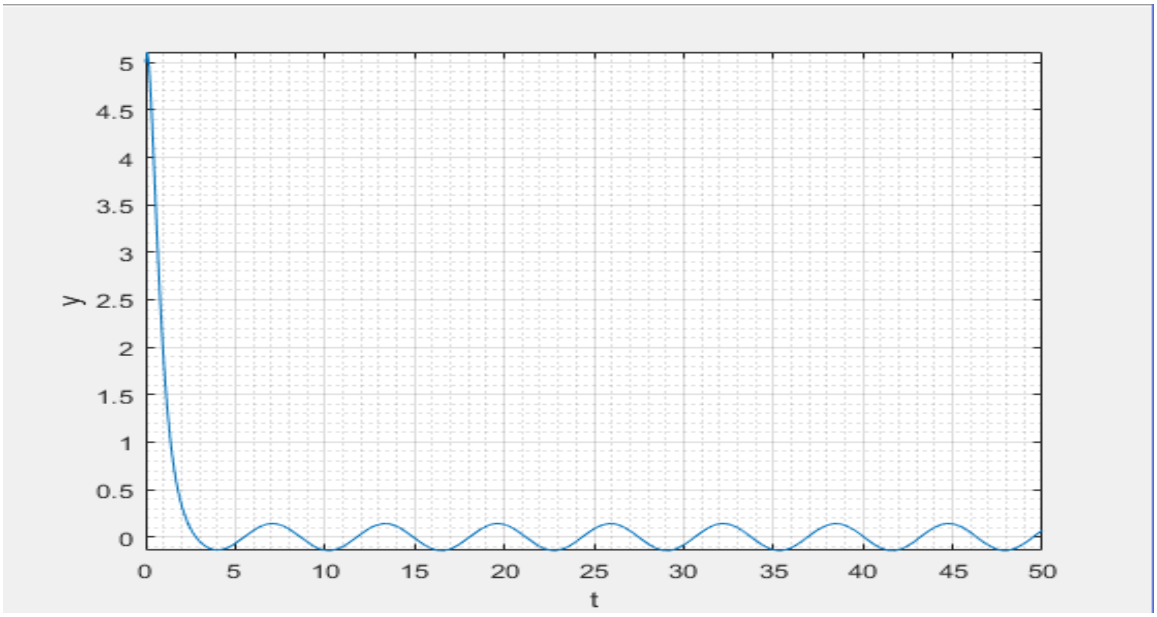

MATLAB CODE

```
commandwindow

clear

clc

close all

syms t

y = ((17.6*exp(-2*t))-(12.7*exp(-3*t))+(0.1*sin(t))+(0.1*cos(t)))

tn = (0:0.1:50);

yn = subs(y,tn);

plot(tn,yn)

xlabel('t')

ylabel('y')

grid on

grid minor

axis tight
```

COMMAND WINDOW

```
y = (88*exp(-2*t))/5 - (127*exp(-3*t))/10 + cos(t)/10 + sin(t)/10
```

MATLAB FIGURE

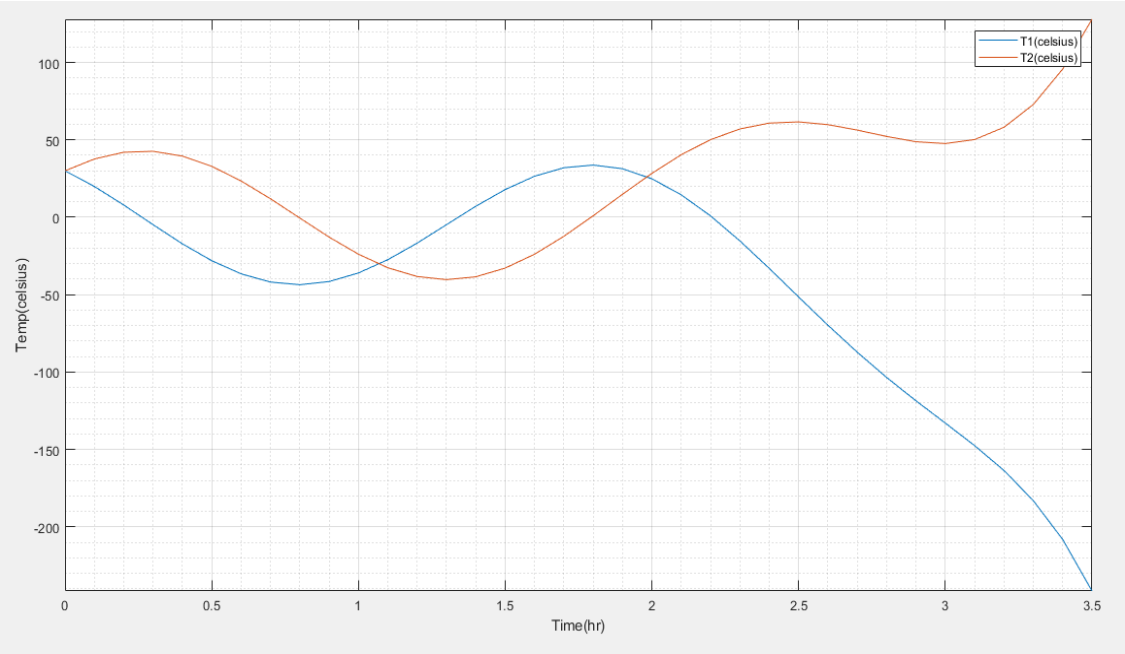


2.)

MATLAB CODE

```
commandwindow
clear
clc
close all
syms T1(t) T2(t)
dT2 = diff(T2,t)
dT1 = diff(T1,t)
g = [dT1 + (3*T2) == exp(-2*t) , dT2 - (3*T1) == exp(2*t)]
cond = [T2(0) == 30 , T1(0) == 30]
d  = dsolve(g,cond)
T2 = d.T2
T1 = d.T1
pretty(T2)
pretty(T1)
tn = [0:0.1:3.5]
b1 = subs(T1,tn)
b2 = subs(T2,tn)
figure(1)
plot(tn,b1,tn,b2)
grid on
grid minor
axis tight
xlabel('Time(hr)')
ylabel('Temp(celsius)')
legend('T1(celsius)','T2(celsius)')
```

MATLAB GRAPH




3.)

MATLAB CODE

```
commandwindow
clear
clc
close all
syms L I(t) R E
eqn = L*diff(I,t)+(R*I) == E;
cond = [I(0) == 0];
ySol(t) = dsolve(eqn,cond)
```

COMMAND WINDOW

```
ySol(t) = (E - E*exp(-(R*t)/L))/R
```

4.)

MATLAB CODE

```
commandwindow
clear
clc
close all
syms t w k a
f = (k*exp(-a*t)*cos(w*t))
laplace(f)
```

COMMAND WINDOW

```
f = k*exp(-a*t)*cos(t*w)


ans = (k*(a + s))/((a + s)^2 + w^2)
```

5.)

MATLAB CODE

```
commandwindow
clear
clc
close all
syms s
f = (pi/((s^2)+(10*pi*s)+(24*(pi^2))))
ilaplace(f)
```

COMMAND WINDOW

ans =

(pi*sinh(t*(25*pi^2 - 8334140006820045/35184372088832)^(1/2))*exp(-5*pi*t))/(25*pi^2 - 8334140006820045/35184372088832)^(1/2)