

**Control**

**Assignment #1**

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**Q1)**

**1)**

t=-4:0.001:10;

x1 = heaviside(t-7);

x2 = heaviside(t-4);

x = x2-x1;

plot(t,x);

axis([2 9 0 2]);



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**2)**

t=-4:0.001:10;

x = 4\* rectangularPulse(3,7,t);

plot(t,x);

axis([ 1 9 0 5]);



**3)**

t=0:0.001:15;

x = heaviside(t-4) + (t-6).\*heaviside(t-6)-2\*(t-9).\*heaviside(t-9)+(t-11).\*heaviside(t-11);

plot(t,x);



**Q2)**

**1)**

t=0:0.0001:15;

m = sin(200\*pi\*t) + cos(750\*pi\*t);

s= sin(200\*pi\*t) - cos(750\*pi\*t);

subplot(2,1,1);

plot(t,m);

axis([2 2.04 -2 2]);

subplot(2,1,2);

plot(t,s);

axis([2 2.04 -2 2]);



**2)**

t=0:0.0001:15;

m = sin(200\*pi\*t) + cos(750\*pi\*t);

s= sin(200\*pi\*t) - cos(750\*pi\*t);

subplot(2,1,1);

plot(t,m);

axis([2 2.04 -2 2]);

subplot(2,1,2);

plot(t,s);

axis([2 2.04 -2 2]);

**Q3)**

**1)**

 syms t;

 dsolve('10\*Dy+20\*y = 10' , 'y(0) = 0')

**ans = 1/2 - exp(-2\*t)/2**

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**2)**

 syms t;

 dsolve('D2y + 2\*Dy + 4\*y = 5\*cos(1000\*t)' , 'y(0) = 0')

**ans =**

**sin(3^(1/2)\*t)\*((625\*cos(1000\*t - 3^(1/2)\*t))/124999500002 - (625\*cos(1000\*t + 3^(1/2)\*t))/124999500002 - (1249995\*sin(1000\*t + 3^(1/2)\*t))/499998000008 + (1249995\*sin(1000\*t - 3^(1/2)\*t))/499998000008 + (1250005\*3^(1/2)\*cos(1000\*t + 3^(1/2)\*t))/1499994000024 + (1250005\*3^(1/2)\*cos(1000\*t - 3^(1/2)\*t))/1499994000024 + (312499375\*3^(1/2)\*sin(1000\*t + 3^(1/2)\*t))/374998500006 + (312499375\*3^(1/2)\*sin(1000\*t - 3^(1/2)\*t))/374998500006) - (5\*3^(1/2)\*cos(3^(1/2)\*t)\*((sin(t\*(3^(1/2) - 1000)) - cos(t\*(3^(1/2) - 1000))\*(3^(1/2) - 1000))/((3^(1/2) - 1000)^2 + 1) + (sin(t\*(3^(1/2) + 1000)) - cos(t\*(3^(1/2) + 1000))\*(3^(1/2) + 1000))/((3^(1/2) + 1000)^2 + 1)))/6 + C4\*exp(-t)\*sin(3^(1/2)\*t) - (5\*3^(1/2)\*exp(-t)\*cos(3^(1/2)\*t)\*((3^(1/2) - 1000)/((3^(1/2) - 1000)^2 + 1) + (3^(1/2) + 1000)/((3^(1/2) + 1000)^2 + 1)))/6**

**Q4)**

**1)**

syms t;

dsolve('Dy+ 5\*y = 10\*heaviside(t)' , 'y(0)=3')

**ans =**

**3\*exp(-5\*t) + 2\*exp(-5\*t)\*heaviside(t)\*(exp(5\*t) - 1)**

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**2)**

syms t;

dsolve('D2y + 2\*Dy + 2\*y = 5 \*cos(2000\*t)' , 'y(0)=1 , Dy(0) =2')

**ans =**

**sin(t)\*((5\*cos(1999\*t))/7992004 + (5\*cos(2001\*t))/8008004 + (9995\*sin(1999\*t))/7992004 + (10005\*sin(2001\*t))/8008004) - cos(t)\*((9995\*cos(1999\*t))/7992004 - (10005\*cos(2001\*t))/8008004 - (5\*sin(1999\*t))/7992004 + (5\*sin(2001\*t))/8008004) + (8000009999997\*exp(-t)\*cos(t))/8000000000002 + (23999990000001\*exp(-t)\*sin(t))/8000000000002**

**Q5)**

**1-**





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**2-**





**Q6)**



**1)**

syms t w;

y = (10\*exp(-10\*t)).\*heaviside(t);

x = fourier(y,w)

subplot(2,1,1);

ezplot(abs(x));

subplot(2,1,2);

ezplot(angle(x));

**output :**

x =

10/(w\*i + 10)



**2)**

syms t w;

y = (10\*exp(-10\*t).\*cos(100\*t)).\*heaviside(t);

x = fourier(y,w)

subplot(2,1,1);

ezplot(abs(x));

subplot(2,1,2);

ezplot(angle(x));

**Output :**

**x =**

**5/(w\*i + 10 - 100\*i) + 5/(w\*i + 10 + 100\*i)**

**Q7)**

**1)**

syms t

f =(10 - 10\*exp(-5\*t))\*heaviside(t);

laplace(f)

**ans =**

**10/s - 10/(s + 5)**

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**2)**

f =(30 - 10\*exp(-5\*t)\*cos(100\*t))\*heaviside(t);

laplace(f)

**ans =**

**30/s - (10\*(s + 5))/((s + 5)^2 + 10000)**

**Q8)**

**1)**

h = zpk(-6,[-1 -3] ,1)

pzmap(h)

**h =**

 **(s+6)**

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 **(s+1) (s+3)**

Continuous-time zero/pole/gain model.

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**2)**

h = zpk(-3,[-1 1+2\*i 1-2\*i ,1)

pzmap(h)



**h =**

 **(s+3)**

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 **(s+1) (s^2 - 2s + 5)**

Continuous-time zero

/pole/gain model.

**Q9)**

**1)**

syms s

h = (s+6)/((s+1)\*(s+3));

ilaplace(h)

**ans =**

**(5\*exp(-t))/2 - (3\*exp(-3\*t))/2**

**2)** syms s

h = (s+3)/((s+1)\*(s^2 - 2\*s +5 ))

ilaplace(h)

**ans =**

**exp(-t)/4 - (exp(t)\*(cos(2\*t) - 3\*sin(2\*t)))/4**