Ce devoir est pour comlpéter le méthode de Newmark au devoir 1.

# EX1

## Q 5

%Resolution de l'equation (1) avec un schema de NEWMARK

### Q 5.1.1

```
gama = 0.5; beta = 0.25;
deltat=0.01;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A4 = inv(B).*C;
U4(:,1) = [q0;Dq0];
for j = 2:length(t)
    U4(:,j) = A4*U4(:,j-1);
end
```

### Q 5.1.2

```
clf;
plot(t,U4(1,:))
hold on;
plot(t,U3(1,:))
hold on ;
plot(t,U2(1,:))
hold on;
plot(t,U1(1,:))
hold on;
plot(t,cos(2*pi*t))
legend('Newmark','Runge Kutta', 'Euler implicite','Euler explicite','1er Solution')
```

### Q 5.1.3

```
for j = 1:length(t)
    Eetoile4(j) = 0.5*(U4(2,j)*U4(2,j)+4*pi*pi*U4(1,j)*U4(1,j));
end
clf;
plot(t,Eetoile)
hold on;
plot(t,Eetoile1)
hold on;
plot(t,Eetoile2)
hold on;
plot(t,Eetoile3)
hold on;
plot(t, Eetoile4)
```

```
title('Evalution de E')
legend('Eetoile', 'Eetoile1','Eetoile2','Eetoile3','Eetoile4')
```

### Q 5.1.4

```
%on peut changer valeur de deltat,et comparer les résultat au dessous
deltat1=0:deltat:1;
for j = 1:length(deltat1)
    deltat=deltat1(j);
    Btest = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
    Ctest = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
    Atest=inv(B).*C;
    [z,d]=eig(Atest);
    Utest(:,j)=[z;d];
end
plot(deltat1,Utest(1,:));
hold on;
plot(deltat1,Utest(2,:));
```

### Q 5.2.1

```
gama = 0.5; beta = 0.0;
deltat=0.01;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A5 = inv(B).*C;
U5(:,1) = [q0;Dq0];
for j = 2:length(t)
    U5(:,j) = A5*U5(:,j-1);
end
```

### Q 5.2.2

```
clf;
plot(t,U5(1,:))
hold on;
plot(t,U4(1,:))
hold on;
plot(t,U3(1,:))
hold on ;
plot(t,U2(1,:))
hold on;
plot(t,U1(1,:))
hold on;
plot(t,cos(2*pi*t))
legend('Newmark2','Newmark','Runge Kutta', 'Euler implicite','Euler explicite','1er Solution')
```

**Q 5.2.3**

```
gama = 0.5; beta = 0.25;
deltat=0.2;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A6 = inv(B).*C;
U6(:,1) = [q0;Dq0];
for j = 2:length(t)
    U6(:,j) = A6*U6(:,j-1);
end
deltat=0.2;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A7 = inv(B).*C;
U7(:,1) = [q0;Dq0];
for j = 2:length(t)
    U7(:,j) = A7*U7(:,j-1);
end
gama = 0.5; beta = 0.0;
deltat=0.2;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A8 = inv(B).*C;
U8(:,1) = [q0;Dq0];
for j = 2:length(t)
    U8(:,j) = A8*U8(:,j-1);
end
deltat=0.5;
B = [1+beta*deltat*deltat*w0*w0,0;gama*deltat*w0*w0,1];
C = [1-(0.5-beta)*deltat*deltat*w0*w0,deltat;-(1-gama)*deltat*w0*w0,1];
A9 = inv(B).*C;
U9(:,1) = [q0;Dq0];
for j = 2:length(t)
    U9(:,j) = A9*U9(:,j-1);
end
clf;
plot(t,U6(1,:))
hold on;
plot(t,U7(1,:))
hold on;
plot(t,U8(1,:))
hold on;
plot(t,U9(1,:))
legend('Newmark(gama=0.5,beta=0.25)1','Newmark(gama=0.5,beta=0.25)2','Newmark(gama=0.
```

5, beta=0)1','Newmark(gama=0.5, beta=0)2')