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% Program 7.7: MATLAB program for dynamic response by Wilson-theta Method %
% Wilson theta method
%*****
clear all;
close all;
clc;
%u = zeros(1,1001);
u(1000) = 0;
%v = zeros(1,1001);
v(1000) = 0;
%an = zeros(1,1001);
an(1000) = 0;
%s = zeros(1,1001);
s(1000) = 0;
%p = zeros(1,1001);
p(1000) = 0;
ma=110000;
k=10075582;
wn=sqrt(k/ma);
theta=1.42;
r=0.07;
c=2.0*r*sqrt(k*ma);
u(1)=0;
v(1)=0;
tt=3.0;
n=300;
n1=n+1;
dt=tt/n;
td=.75;
jk=td/dt;
for m=1:n1
p(m)=0.0;
end;
jk1=jk+1;
for n=1:jk1;
t=(n-1)*dt;
p(n)=450000*(1-t/td)*exp(-2.0*t/td);
end;
an(1)=(p(1)-c*v(1)-k*u(1))/ma;
kh=k+3.0*c/(theta*dt)+6.0*ma/(theta*dt)^2;
a=6.0*ma/(theta*dt)+3.0*c;
b=3.0*ma+theta*dt*c/2.0;
for i=1:n1;
s(i)=(i-1)*dt;
end;
for i=2:n1;
ww=(p(i)-p(i-1))*theta+a*v(i-1)+b*an(i-1);
xx=ww/kh;
zz=(6.0*xx/((theta*dt)^2)-6.0*v(i-1)/(theta*dt)-3.0*an(i-1))/theta;
yy=dt*an(i-1)+dt*zz/2.0;
v(i)=v(i-1)+yy;
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an(i)=an(i-1)+zz;  
vv=dt*v(i-1)+dt*dt*(3.0*an(i-1)+zz)/6.0;  
u(i)=u(i-1)+vv;  
end;  
figure(1);  
plot(s,u);  
xlabel(' time (t) in seconds')  
ylabel(' Response displacement u in m')  
title(' dynamic response')
```