Ex1.a.

//AB1 ordin 2

echo off;

global kp tp zeta u;//ord 2; ord1: kp tp u; ord1sin: kp tp a omega; //2poli 1zero: kp t1 t2 t3 u

kp=1;tp=2;zeta=0.3;tf=40;h=0.01;q=0.1;

u=1;t0=0;y10=0;y20=0;

t(1)=t0;

y(1,1)=y10;y(1,2)=y20;//ord2; ord1: y(1)=y0;

uc(1)=u;//treapta; sin: uc(1)=0

tc=t0;

yc2=[y10 y20];//ord2; ord1: yc2 = y0

yc1=yc2+h\*ord2a(tc,yc2); //in functie de formula RK

tc=tc+h;

for i=2:q/h

yc=yc1+h\*(3\*ord2a(tc,yc1)-ord2a(tc-h,yc2))/2; //formula AB, yk+1 //devine yc, yk devine yc1, yk-1 devine yc2, yk-2 devine yc3, yk-3 //devine yc4

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(2)=tc;

y(2,1)=yc(1);y(2,2)=yc(2);//ord2; ord1: y(2)=yc

uc(2)=u;//treapta; sin: uc(2)=a\*sin(omega\*tc)

for k=3:(tf-t0)/q+1

for i=1:q/h

yc=yc1+h\*(3\*ord2a(tc,yc1)-ord2a(tc-h,yc2))/2;//formula AB

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(k)=tc;

y(k,1)=yc(1);y(k,2)=yc(2);//ord2, ord1: y(k)=yc

uc(k)=u;//treapta; sin: uc(k)=a\*sin(omega\*tc)

end;

clf;

subplot(211);//doar la ord2

plot(t,y(:,1),'-r',t,uc,'-b');//ord2, ord1: plot(t,y,’-r’,t,uc,’-b’);

grid;

title('raspuns sistem ordin doi');

subplot(212);//doar la ord2

plot(t,y(:,2),'-r');//doar la ord2

grid;

title('derivata raspuns sistem ordin doi');

//AB3 ordin 1

echo off;

global kp tp u;

t(1)=t0;

y(1)=y0;uc(1)=u;

tc=t0;

yc4=y0;

k0=h\*ord1(tc,yc4);

k1=h\*ord1(tc+h,yc4+k0);

yc3=yc4+(k0+k1)/2;

tc=tc+h;

k0=h\*ord1(tc,yc3);

k1=h\*ord1(tc+h,yc3+k0);

yc2=yc3+(k0+k1)/2;

tc=tc+h;

k0=h\*ord1(tc,yc2);

k1=h\*ord1(tc+h,yc2+k0);

yc1=yc2+(k0+k1)/2;

tc=tc+h;

for i=4:q/h

yc=yc1+h\*(55\*ord1(tc,yc1)-59\*ord1(tc-h,yc2)...

+37\*ord1(tc-2\*h,yc3)-9\*ord1(tc-3\*h,yc4))/24;

yc4=yc3;yc3=yc2;yc2=yc1;yc1=yc;

tc=tc+h;

end;

t(2)=tc;y(2)=yc;uc(2)=u;

for k=3:(tf-t0)/q+1,

for i=1:q/h,

yc=yc1+h\*(55\*ord1(tc,yc1)-59\*ord1(tc-h,yc2)...

+37\*ord1(tc-2\*h,yc3)-9\*ord1(tc-3\*h,yc4))/24;

yc4=yc3;yc3=yc2;yc2=yc1;yc1=yc;

tc=tc+h;

end;

t(k)=tc;y(k)=yc;uc(k)=u;

end;

clf;

plot(t,y,'-r',t,uc,'-b');

grid;

title('raspuns sistem ordin unu');

//AM1 , 2 poli un zero

echo off;

global kp t1 t2 t3 u;

t(1)=t0;y(1,1)=y10;y(1,2)=y20;uc(1)=u;

tc=t0; yc1=[y10 y20 y30 y40];

for k=2:(tf-t0)/q+1

for i=1:q/h

k0=h\*ord2p1z(tc,yc1);

k1=h\*ord2p1z(tc+h,yc1+k0);

yc=yc1+(k0+k1)/2;

yc=yc1+h\*(ord2p1z(tc+h,yc)+ord2p1z(tc,yc1))/2;

tc=tc+h;yc1=yc;

end;

t(k)=tc;y(k,1)=yc(1);y(k,2)=yc(2);uc(k)=u;

end;

clf;

subplot(211);

plot(t,y(:,1),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,2),'-r');

grid;

title('derivata raspuns sistem ordin doi');

//AM2 sistem de ordin 2

echo off;

global kp tp zeta u;

t(1)=t0;y(1,1)=y10;y(1,2)=y20;uc(1)=u;

tc=t0; yc2=[y10 y20];

yc1=yc2+h\*ord2a(tc,yc2);

tc=tc+h;

for i=2:q/h

yc=yc1+h\*ord2a(tc,yc2);

yc=yc1+h\*(5\*ord2a(tc+h,yc)+8\*ord2a(tc,yc1)-ord2a(tc-h,yc2))/12;

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(2)=tc;y(2,1)=yc(1);y(2,2)=yc(2);uc(2)=u;

for k=3:(tf-t0)/q+1

for i=1:q/h

yc=yc1+h\*ord2a(tc,yc2);

yc=yc1+h\*(5\*ord2a(tc+h,yc)+8\*ord2a(tc,yc1)-ord2a(tc-h,yc2))/12;

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(k)=tc;y(k,1)=yc(1);y(k,2)=yc(2);uc(k)=u;

end;

clf;

subplot(211);

plot(t,y(:,1),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,2),'-r');

grid;

title('derivata raspuns sistem ordin doi');

//AM3 , sistem de ordin 2

echo off;

global kp tp zeta u;

t(1)=t0;y(1,1)=y10;y(1,2)=y20;uc(1)=u;

tc=t0; yc3=[y10 y20];

yc2=yc3+h\*ord2a(tc,yc3);

tc=tc+h;

yc1=yc2+h\*ord2a(tc,yc2);

tc=tc+h;

for i=3:q/h

yc=yc1+h\*ord2a(tc,yc2);

yc=yc1+h\*(9\*ord2a(tc+h,yc)+19\*ord2a(tc,yc1)-5\*ord2a(tc-h,yc2)+...

ord2a(tc-2\*h,yc3))/24;

tc=tc+h;yc3=yc2;yc2=yc1;yc1=yc;

end;

t(2)=tc;y(2,1)=yc(1);y(2,2)=yc(2);uc(2)=u;

for k=3:(tf-t0)/q+1

for i=1:q/h

yc=yc1+h\*ord2a(tc,yc2);

yc=yc1+h\*(9\*ord2a(tc+h,yc)+19\*ord2a(tc,yc1)-5\*ord2a(tc-h,yc2)+...

ord2a(tc-2\*h,yc3))/24;

tc=tc+h;yc3=yc2;yc2=yc1;yc1=yc;

end;

t(k)=tc;y(k,1)=yc(1);y(k,2)=yc(2);uc(k)=u;

end;

clf;

subplot(211);

plot(t,y(:,1),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,2),'-r');

grid;

title('derivata raspuns sistem ordin doi');

//PC1 , 2 poli un zero

echo off;

global kp t1 t2 t3 u;

t(1)=t0;y(1,1)=y10;y(1,2)=y20;uc(1)=u;

tc=t0; yc2=[y10 y20];

yc1=yc2+h\*ord2p1zb(tc,yc2);

tc=tc+h;

for i=2:q/h

yca=yc1+h\*(3\*ord2p1zb(tc,yc1)-ord2p1zb(tc-h,yc2))/2;

yc=yc1+h\*(ord2p1zb(tc+h,yca)+ord2p1zb(tc,yc1))/2;

while max(abs(yc(1)-yca(1)),abs(yc(2)-yca(2)))>prec

yca=yc;

yc=yc1+h\*(ord2p1zb(tc+h,yca)+ord2p1zb(tc,yc1))/2;

end;

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(2)=tc;y(2,1)=yc(1);y(2,2)=yc(2);uc(2)=u;

for k=3:(tf-t0)/q+1

for i=1:q/h

yca=yc1+h\*(3\*ord2p1zb(tc,yc1)-ord2p1zb(tc-h,yc2))/2;

yc=yc1+h\*(ord2p1zb(tc+h,yca)+ord2p1zb(tc,yc1))/2;

while max(abs(yc(1)-yca(1)),abs(yc(2)-yca(2)))>prec

yca=yc;

yc=yc1+h\*(ord2p1zb(tc+h,yca)+ord2p1zb(tc,yc1))/2;

end;

tc=tc+h;yc2=yc1;yc1=yc;

end;

t(k)=tc;y(k,1)=yc(1);y(k,2)=yc(2);uc(k)=u;

end;

clf;

subplot(211);

plot(t,y(:,1),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,2),'-r');

grid;

title('derivata raspuns sistem ordin doi');

//PC2 , un 2 poli zero [ord2p1zb inlocuit cu numele fisierului functie]

echo off;

global kp t1 t2 t3 u;

t(1)=t0;y(1,1)=y10;y(1,2)=y20;uc(1)=u;

tc=t0;yc3=[y10 y20];

k0=h\*ord2p1zb(tc,yc3);

k1=h\*prd2p1zb(tc+h/2,yc3+k0/2);

k2=h\*ord2p1zb(tc+h,yc3+2\*k1-k0);

yc2=yc3+h\*(k0+4\*k1+k2)/6;

tc=tc+h;

k0=h\*ord2p1zb(tc,yc2)

k1=h\*ord2p1zb(tc+h/2,yc2+k0/2);

k2=h\*ord2p1zb(tc+h,yc2+2\*k1-k0);

yc1=yc2+h\*k0+4\*k1+k2)/6;

tc=tc+h;

for i=3:q/h

yca=yc1+h\*(23\*ord2p1zb(tc,yc1)-16\*ord2p1zb(tc-h,yc2)+5\*ord2p1zb(tc-2\*h,yc3)/12;

yc=yc1+h\*(5\*ord2p1zb(tc+h,yca)+8\*ord2p1zb(tc,yc1)-ord2p1zb(tc-h,yc2)/12;

while sqrt((yc(1)-yca(1))^2+(yc(2)-yca(2))^2)>prec

yca=yc;

yc=yc1+h\*(5\*ord2p1zb(tc+h,yca)+8\*ord2p1zb(tc,ya)-ord2p1zb(tc-h,yc2))/12;

end;

tc=tc+h;yc3=yc2;yc2=yca;yc1=yc;

end;

t(2)=tc;y(2,1)=yc(1);y(2,2)=yc(2);uc(2)=u;

for k=3:(tf-t0)/q+1;

for i=1:q/h;

yca=yc1+h\*(23\*ord2p1zb(tc,yc1)-16\*ord2p1zb(tc-h,yc2)+5\*ord2p1zb(tc-2\*h,yc3))12;

yc=yc1+h\*(5\*ord2p1zb(tc+h,yca)+8\*ord2p1zb(tc,yc1)-ord2p1zb(tc-h,yc2))/12;

while sqrt((yc(1)-yca(1))^2+(yc(2)-yca(2))^2)>prec

yca=yc;

yc=yc1+h\*(5\*ord2p1zb(tc+h,yca)+8\*ord2p1zb(tc,yc1)-ord2p1zb(tc-h,yc2))/12;

end;

tc=tc+h;yc3=yc2;yc2=yc1;yc1=yc;

end;

t(k)=tc;y(k,1)=yc(1);y(k,2)=yc2;uc(k)=u;

end;

clf;

subplot(211);

plot(t,y(:,1),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,2),'-r');

grid;

title('raspuns sistem ordin doi');

//PC3 ordin 1

echo off;

global kp tp u;

t(1)=t0;y(1)=y0;uc(1)=u;

tc=t0; yc4=y0;

k0=h\*ord1(tc,yc4);

k1=h\*ord1(tc+h/2,yc4+k0/2);

k2=h\*ord1(tc+h,yc4+2\*k1-k0);

yc3=yc4+h\*(k0+4\*k1+k2)/6;

tc=tc+h;

k0=h\*ord1(tc,yc3);

k1=h\*ord1(tc+h/2,yc3+k0/2);

k2=h\*ord1(tc+h,yc3+2\*k1-k0);

yc2=yc3+h\*(k0+4\*k1+k2)/6;

tc=tc+h;

k0=h\*ord1(tc,yc2);

k1=h\*ord1(tc+h/2,yc2+k0/2);

k2=h\*ord1(tc+h,yc2+2\*k1-k0);

yc1=yc2+h\*(k0+4\*k1+k2)/6;

tc=tc+h;

for i=4:q/h

yca=yc1+h\*(55\*ord1(tc,yc1)-59\*ord1(tc-h,yc2)+37\*ord1(tc-2\*h,yc3)...

-9\*ord1(tc-3\*h,yc4))/24;

yc=yc1+h\*(9\*ord1(tc+h,yca)+19\*ord1(tc,yc1)-5\*ord1(tc-h,yc2)...

+ord1(tc-2\*h,yc3))/24;

while abs(yc-yca)>prec

yca=yc;

yc=yc1+h\*(9\*ord1(tc+h,yca)+19\*ord1(tc,yc1)...

-5\*ord1(tc-h,yc2)+ord1(tc-2\*h,yc3))/24;

end;

tc=tc+h;yc4=yc3;yc3=yc2;yc2=yc1;yc1=yc;

end;

t(2)=tc;y(2)=yc;uc(2)=u;

for k=3:(tf-t0)/q+1

for i=1:q/h

yca=yc1+h\*(55\*ord1(tc,yc1)-59\*ord1(tc-h,yc2)+37\*ord1(tc-2\*h,yc3)...

-9\*ord1(tc-3\*h,yc4))/24;

yc=yc1+h\*(9\*ord1(tc+h,yca)+19\*ord1(tc,yc1)-5\*ord1(tc-h,yc2)...

+ord1(tc-2\*h,yc3))/24;

while abs(yc-yca)>prec

yca=yc;

yc=yc1+h\*(9\*ord1(tc+h,yca)+19\*ord1(tc,yc1)-5\*ord1(tc-h,yc2)...

+ord1(tc-2\*h,yc3))/24;

end;

tc=tc+h;yc4=yc3;yc3=yc2;yc2=yc1;yc1=yc;

end;

t(k)=tc;y(k)=yc;uc(k)=u;

end;

clf;

plot(t,y,'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin unu');

Ex1.b.

//ode23 ordin 1 sin

echo off;

global kp tp a w; //pui ce variabile ai in fisierul functie

kp=2;tp=1;a=1;w=1;t0=0;tf=20;y0=0;

[t,y]=ode23('ord1sin',[t0 tf],y0);

for i=1:length(t);

uc(i)=a\*sin(w\*t(i));

end;

clf;

plot(t,y,'-r',t,uc,'-b');

grid;

title('raspuns sistem ordin unu');

//ode23 ordin 2

echo off;

global kp t1 t2 t3 u;

kp=2;t1=10;t2=1;t3=2;u=1;t0=0;tf=40;y10=0;y20=0;

[t,y]=ode23('ord2p1zb',[t0 tf],[y10 y20]);

for i=1:length(t);

uc(i)=u;

end;

clf;

subplot(211);

plot(t,y(:,2),'-r',t,uc,'-g');

grid;

title('raspuns sistem ordin doi');

subplot(212);

plot(t,y(:,1),'-r');

grid;

title('derivata raspuns sistem ordin doi');

Ex2 //sisteme – apel newtraph

function [sol,iter]=newtraph(F,dF,x0,prec)

n=length(x0);

dx=2\*prec\*ones(n,1);

x\_c=x0;

iter=0;

while (norm(dx)>prec),

J=feval(nume\_dF,x\_c);

dx=-inv(J)\*feval(F,x\_c);

x\_c=x\_c+dx;

iter=iter+1;

end;

sol=x\_c;

[xstar,iter]=newtraph('F','dF',[-1,3,-2])

//gradient [minim / maxim al unei functii]

function [x,nr\_it]=opt\_grad(x0,epsilon)

nr\_it=1;x\_curent=x0;itermax=1500;

h=0.001;

p=0.001;

for k=1:n,

v=zeros(1,n);v(k)=1;

grad\_curent(k)=(f1(x0+h/2\*v)-f1(x0-h/2\*v))/h;

end;

while (norm(grad\_curent)>=epsilon)&(nr\_it<=itermax)

%pentru o funcţie de maximizat „–” se înlocuieşte cu „+”

x\_viitor=x\_curent-p\*grad\_curent/norm(grad\_curent);

for k=1:n,

v=zeros(1,n);v(k)=1;

grad\_viitor(k)=(f1(x\_viitor+h/2\*v)-f1(x\_viitor-h/2\*v))/h;

end;

x\_curent=x\_viitor;

grad\_curent=grad\_viitor;

nr\_it=nr\_it+1;

end;

x=x\_curent;

function y=f1(x)

y=5\*x^2+2\*x+13;

//apel\_opt\_grad

[x,nr\_it]=opt\_grad(0,1e-3)

//ex3 subpunct c) matrice monica m > n

echo off;

[m,n]=size(a);

a1=a;

q=eye(m);

for k=1:n

sig=0;

for i=k:m

sig=sig+a(i,k)^2;

end

sig=sign(a(k,k))\*sqrt(sig);

for i=1:m

if i<=k-1

v(i)=0;

elseif i==k

v(i)=sig+a(k,k);

else v(i)=a(i,k);

end

end

beta=sig\*(sig+a(k,k));

q1=eye(m)-(v'\*v)/beta;

q=q\*q1;

a=q1\*a;

end

//ex3 subpunct c) matrice patratica n x n

echo off;

[m,n]=size(a);

q=eye(m);

p=eye(n);

a1=a;

k=1;

prec=1e-4;

ind=1;

for j=1:n

norm(j)=0;

for i=1:m

norm(j)=norm(j)+a(i,j)^2;

end

end

while ind ==1 & k<=n

l=k;

for j=k+1:n

if norm(j)>norm(l)

l=j;

end

end

if norm(l)==0

ind=0;

else if l~=k

p1=eye(n);p1(k,k)=0;p1(l,l)=0;p1(l,k)=1;p1(k,l)=1;

a=a\*p1;

p=p1\*p;

end

sig=0;

for i=k:m

sig=sig+a(i,k)^2;

end

sig=sign(a(k,k))\*sqrt(sig);

for i=1:m

if i<=k-1

v(i)=0;

elseif i==k

v(i)=sig+a(k,k);

else v(i)=a(i,k);

end

end

beta=sig\*(sig+a(k,k));

q1=eye(m)-(v'\*v)/beta;

a=q1\*a;

q=q1\*q;

for j=k+1:n

norm(j)=0;

for i=k+1:m

norm(j)=norm(j)+a(i,j)^2;

end

end

k=k+1;

end

end

r=0;

for i=1:min(m,n)

if r<=min(m,n)

if abs(a(i,i))>prec

r=r+1;

end

end

end

a=a';

q2=eye(n);

p2=eye(r);

for k=1:r

sig=0;

for i=k:n

sig=sig+a(i,k)^2;

end

sig=sign(a(k,k))\*sqrt(sig);

for i=1:n

if i<=k-1

v(i)=0;

elseif i==k

v(i)=sig+a(k,k);

else v(i)=a(i,k);

end

end

beta=sig\*(sig+a(k,k));

q1=eye(n)-(v'\*v)/beta;

a=q1\*a;

q2=q2\*q1;

end

Z=p\*q2;

aint=a;

for k=r:-1:1

a(k,k)=1/a(k,k);

for i=k-1:-1:1

s=0;

for j=i+1:r

s=s+a(i,j)\*a(j,k);

end

a(i,k)=-s/a(i,i);

end

end

psa=Z\*a\*q;