program qazkondensatmubariz1;

{$APPTYPE CONSOLE}

uses

SysUtils;

var

as1,stt,st1,q,qq,hh,rk,m0,patm,p0,kk,rc,bet,st2,df1,df2,df3,bc,tau,taut,taum,h,ak,aa,sdd,max,gk:real;

k,i,j,n,k1,k2:integer;

mm:array [0..40] of real;

dp,r:array [0..40] of real;

sig,m,p:array [0..40,0..36000] of real;

a,c:array [0..40,0..36000] of real;

f:text;

function zx(x:real):real;

begin

zx:=1-0.1162\*0.01\*x+0.3744\*0.00001\*x\*x-0.2965\*0.000000001\*x\*x\*x-0.1975\*0.00000000001\*x\*x\*x\*x;

end;

function zpp(x:real):real;

begin

zpp:=-0.1162\*0.01+2\*0.3744\*0.00001\*x-3\*0.2965\*0.000000001\*x\*x-4\*0.1975\*0.00000000001\*x\*x\*x;

end;

function kp(x:real):real;

begin

kp:=kk\*exp(ak\*(x-p0));

end;

function sp(x:real):real;

begin

sp:=0.814286\*x;

end;

function spp(x:real):real;

begin

spp:=0.814286;

end;

function ap(x:real):real;

begin

ap:=1.116+0.1157\*0.01\*x+0.23674\*0.000001\*x\*x;

end;

function app(x:real):real;

begin

app:=0.1157\*0.01+2\*0.23674\*0.000001\*x;

end;

function cp(x:real):real;

begin

cp:=(0.637\*0.0001-0.5057\*0.000001\*x+0.6265\*0.00000001\*x\*x-0.1595\*0.0000000001\*x\*x\*x+0.13\*0.0000000000001\*x\*x\*x\*x);

end;

function cpp(x:real):real;

begin

cpp:=(-0.5057\*0.000001+2\*0.6265\*0.00000001\*x-3\*0.1595\*0.0000000001\*x\*x+4\*0.13\*0.0000000000001\*x\*x\*x);

end;

function gamp(x:real):real;

begin

gamp:=194.899-0.42974\*0.1\*x+0.1335\*0.0001\*x\*x-0.6053\*0.000001\*x\*x\*x+0.622\*0.000000001\*x\*x\*x\*x;

end;

function gampp(x:real):real;

begin

gampp:= -0.42974\*0.1+2\*0.1335\*0.0001\*x-3\*0.6053\*0.000001\*x\*x+4\*0.622\*0.000000001\*x\*x\*x;

end;

function mugp(x:real):real;

begin

mugp:= ((0.0126+0.257\*0.0001\*x+0.1633\*0.0000001\*x\*x)\*0.00000001/(86400));

end;

function mukp(x:real):real;

begin

mukp:= ((0.6+0.3295\*0.01\*x+0.1044\*0.0001\*x\*x-0.1558\*0.0000001\*x\*x\*x+0.85\*0.00000000001\*x\*x\*x\*x)\*0.00000001/(86400));

end;

function fq(x:real):real;

begin

fq:= 2.0833\*x\*x\*x\*x+4.9167\*x\*x\*x-5.5708\*x\*x-0.277\*x+0.882;

end;

function fk(x:real):real;

begin

fk:= 1.8864\*x\*x+0.1889\*x+0.0005;

end;

function nn1(x:real):real;

begin

nn1:= ((x\*bet\*(1-cp(x)\*gamp(x)))/(mugp(x)\*zx(x)))\*kp(x);

end;

function nn2(x:real):real;

begin

nn2:= ((x\*bet\*cp(x))/(mugp(x)\*zx(x)))\*kp(x) ;

end;

function mm1(x:real):real;

begin

mm1:= (sp(x)/(mukp(x)\*ap(x)))\*kp(x) ;

end;

function mm2(x:real):real;

begin

mm2:= (1/(mukp(x)\*ap(x)))\*kp(x) ;

end;

function ll1(x:real):real;

begin

ll1:= (x\*bet\*(1-cp(x)\*gamp(x))/zx(x)) ;

end;

function ll11(x:real):real;

begin

ll11:=

(1/sqr(zx(x)))\*(bet\*zx(x)\*((1-cp(x)\*gamp(x))-x\*(cpp(x)\*gamp(x)+cp(x)\*gampp(x)))-x\*bet\*(1-cp(x)\*gamp(x))\*zpp(x))

;

end;

function ll2(x:real):real;

begin

ll2:=

(x\*bet\*cp(x))/zx(x)

;

end;

function ll22(x:real):real;

begin

ll22:=

(1/sqr(zx(x)))\*(bet\*zx(x)\*(cp(x)+x\*cpp(x))-bet\*x\*cp(x)\*zpp(x))

;

end;

function q1(x:real):real;

begin

q1:=

(sp(x)/ap(x))

;

end;

function q2(x:real):real;

begin

q2:=

(1/ap(x))

;

end;

function q11(x:real):real;

begin

q11:=

(1/sqr(ap(x)))\*(spp(x)\*ap(x)-sp(x)\*app(x))

;

end;

function q22(x:real):real;

begin

q22:=

-(1/sqr(ap(x)))\*app(x)

;

end;

function ff0(x:real):real;

begin

ff0:=

(q1(x)-ll1(x))/(q2(x)-ll2(x))

;

end;

function ff1(x,y,z:real):real;

begin

ff1:=

ll11(x)\*z\*(1-y)+q11(x)\*z\*y

;

end;

function ff2(x,y,z:real):real;

begin

ff2:=

ll22(x)\*z\*(1-y)+q22(x)\*z\*y

;

end;

function ff3(x,y,z:real):real;

begin

ff3:=

ll1(x)\*(1-y)+q1(x)\*y

;

end;

function ff4(x,y,z:real):real;

begin

ff4:=

ll2(x)\*(1-y)+q2(x)\*y

;

end;

function ff5(x,y,z:real):real;

begin

ff5:=z\*q2(x)-z\*ll2(x);

end;

function f1g(x,x1,y,y1:real):real;

begin

f1g:=0.5\*(fq(y)\*nn1(x)+fq(y1)\*nn1(x1));

{f1g:=2\*(fq(y)\*nn1(x)\*fq(y1)\*nn1(x1))/(fq(y)\*nn1(x)+fq(y1)\*nn1(x1));}

end;

function f2g(x,x1,y,y1:real):real;

begin

f2g:=0.5\*(fq(y)\*nn2(x)+fq(y1)\*nn2(x1));

{f2g:=2\*(fq(y)\*nn2(x)\*fq(y1)\*nn2(x1))/(fq(y)\*nn2(x)+fq(y1)\*nn2(x1));}

end;

function f1k(x,x1,y,y1:real):real;

begin

f1k:=0.5\*(fk(y)\*mm1(x)+fk(y1)\*mm1(x1));

{f1k:=2\*(fk(y)\*mm1(x)\*fk(y1)\*mm1(x1))/(fk(y)\*mm1(x)+fk(y1)\*mm1(x1));}

end;

function f2k(x,x1,y,y1:real):real;

begin

f2k:= 0.5\*(fk(y)\*mm2(x)+fk(y1)\*mm2(x1)) ;

{f2k:=2\*(fk(y)\*mm2(x)\*fk(y1)\*mm2(x1))/(fk(y)\*mm2(x)+fk(y1)\*mm2(x1));}

end;

begin

assign(f,'d:\rell.txt'); rewrite(f);

p0:=400; m0:=0.2;patm:=1;

bet:=0.78; bc:=2.5\*0.0001; tau:=1;

hh:=20; rk:=1000; rc:=0.1;

N:=10;ak:=0;

kk:=0.05\*0.000000000001;

q:=1000000;

qq:=q\*(1/(2\*3.14\*hh));

taum:=tau;

taut:=0.001;

for i:=0 to N do begin

r[i]:=i\*ln(rk/rc)/n;

end;

for i:=0 to N do

begin p[i,0]:=p0;

sig[i,0]:=0;

m[i,0]:=m0; end;

h:=ln(rk/rc)/n;

j:=1; k1:=1;k:=0; k2:=1;

repeat

as1:=(f1g(p[0,j-1],p[0,j-1],sig[0,j-1],sig[0,j-1])+f1k(p[0,j-1],p[0,j-1],sig[0,j-1],sig[0,j-1]));

a[0,j]:=1;

c[0,j]:=-qq\*h/as1;

for i:=1 to n-1 do begin

aa:=(exp(-2\*r[i])\*taut/((rc\*rc)\*h\*h));

m[i,j]:=m0\*exp(bc\*(p[i,j-1]-p0));

{m[i,j]:=m[i,j-1];}

df1:=aa\*(f1g(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1])+

f1k(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1]))-aa\*

ff0(p[i,j-1])\*(f2g(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1])+

f2k(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1]));

df2:=aa\*(f1g(p[i,j-1],p[i-1,j-1],sig[i,j-1],sig[i,j-1])+

f1k(p[i,j-1],p[i-1,j-1],sig[i,j-1],sig[i,j-1]))-aa\*

ff0(p[i,j-1])\*(f2g(p[i,j-1],p[i-1,j-1],sig[i,j-1],sig[i,j-1])+

f2k(p[i,j-1],p[i-1,j-1],sig[i,j-1],sig[i,j-1]));

a[i,j]:=df1/(df1+df2\*(1-a[i-1,j])+(ff1(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*

ff2(p[i,j-1],sig[i,j-1],m[i,j-1])));

c[i,j]:=(df2\*c[i-1,j]+p[i,j-1]\*(ff1(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff2(p[i,j-1],sig[i,j-1],m[i,j-1]))-

(ff3(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff4(p[i,j-1],sig[i,j-1],m[i,j-1]))\*

(m[i,j]-m[i,j-1]))/

(df1+df2\*(1-a[i-1,j])+(ff1(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*

ff2(p[i,j-1],sig[i,j-1],m[i,j-1])));

end;

p[n-1,j]:=c[n-1,j]/(1-a[n-1,j]);

p[n,j]:=p[n-1,j];

i:=n-1;

repeat

p[i-1,j]:=a[i-1,j]\*p[i,j]+c[i-1,j];

{write(i-1,' ',j,' ',(pp[i-1,j,k]):6:6);writeln; }

i:=i-1;

until i=0;

m[0,j]:=m0\*exp(bc\*(p[0,j-1]-p0));

aa:=(exp(-2\*r[0])\*taut/((rc\*rc)\*h\*h));

st2:=aa\*(f2g(p[1,j-1],p[2,j-1],sig[1,j-1],sig[2,j-1])+

f2k(p[1,j-1],p[2,j-1],sig[1,j-1],sig[2,j-1]))\*(p[2,j]-p[1,j])

-aa\*(f2g(p[0,j-1],p[1,j-1],sig[0,j-1],sig[1,j-1])+

f2k(p[0,j-1],p[1,j-1],sig[0,j-1],sig[1,j-1]))\*(p[1,j]-p[0,j]);

{sigg[0,j,k]:=sig[0,j-1]+(st2/ff5(p[0,j-1],sig[0,j-1],m[0,j-1]))-

(ff2(p[0,j-1],sig[0,j-1],m[0,j-1])/ff5(p[0,j-1],sig[0,j-1],m[0,j-1]))\*(pp[0,j,k]-p[0,j-1])-

(ff4(p[0,j-1],sig[0,j-1],m[0,j-1])/ff5(p[0,j-1],sig[0,j-1],m[0,j-1]))\*(m[0,j]-m[0,j-1]);}

{st2:=aa\*(f2g(pp[1,j,k-1],pp[2,j,k-1],sigg[1,j,k-1],sigg[2,j,k-1])+

f2k(pp[1,j,k-1],pp[2,j,k-1],sigg[1,j,k-1],sigg[2,j,k-1]))\*(pp[2,j,k]-pp[1,j,k])

-aa\*(f2g(pp[0,j,k-1],pp[1,j,k-1],sigg[0,j,k-1],sigg[1,j,k-1])+

f2k(pp[0,j,k-1],pp[1,j,k-1],sigg[0,j,k-1],sigg[1,j,k-1]))\*(pp[1,j,k]-pp[0,j,k]);}

st1:=aa\*(f1g(p[1,j-1],p[1,j-1],sig[1,j-1],sig[1,j-1])+

f1k(p[1,j-1],p[1,j-1],sig[1,j-1],sig[1,j-1]))\*(p[2,j-1]-p[1,j-1])-aa\*

(f1g(p[0,j-1],p[0,j-1],sig[0,j-1],sig[0,j-1])+

f1k(p[0,j-1],p[0,j-1],sig[0,j-1],sig[0,j-1]))\*(p[1,j-1]-p[0,j-1]);

i:=0;

stt:=st1-ff0(p[0,j-1])\*st2-(ff3(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff4(p[i,j-1],sig[i,j-1],m[i,j-1]))\*(m[i,j]-m[i,j-1]);

sig[i,j]:=sig[i,j-1]+(st2/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))-(ff2(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*

(1/(ff1(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff2(p[i,j-1],sig[i,j-1],m[i,j-1])))\*stt-

(ff4(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*(m[i,j]-m[i,j-1]);

i:=1;

repeat

if i=1 then sdd:=sig[0,j] else sdd:=sig[i,j-1];

m[i,j]:=m0\*exp(bc\*(p[i,j-1]-p0));

aa:=(exp(-2\*r[i])\*taut/((rc\*rc)\*h\*h));

st2:=aa\*(f2g(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1])+

f2k(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1]))\*(p[i+1,j]-p[i,j])-aa\*

(f2g(p[i,j-1],p[i-1,j-1],sig[i,j-1],sdd)+

f2k(p[i,j-1],p[i-1,j-1],sig[i,j-1],sdd))\*(p[i,j]-p[i-1,j]);

st1:=aa\*(f1g(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1])+

f1k(p[i,j-1],p[i+1,j-1],sig[i+1,j-1],sig[i+1,j-1]))\*(p[i+1,j]-p[i,j])-aa\*

(f1g(p[i,j-1],p[i-1,j-1],sig[i,j-1],sdd)+

f1k(p[i,j-1],p[i-1,j-1],sig[i,j-1],sdd))\*(p[i,j]-p[i-1,j]);

stt:=st1-ff0(p[i,j-1])\*st2-(ff3(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff4(p[i,j-1],sig[i,j-1],m[i,j-1]))\*(m[i,j]-m[i,j-1]);

sig[i,j]:=sig[i,j-1]+(st2/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))-(ff2(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*

(1/(ff1(p[i,j-1],sig[i,j-1],m[i,j-1])-ff0(p[i,j-1])\*ff2(p[i,j-1],sig[i,j-1],m[i,j-1])))\*stt-

(ff4(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*(m[i,j]-m[i,j-1]);

{sigg[i,j,k]:=sig[i,j-1]+(st2/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))-(ff2(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*

(pp[i,j,k]-p[i,j-1])-(ff4(p[i,j-1],sig[i,j-1],m[i,j-1])/ff5(p[i,j-1],sig[i,j-1],m[i,j-1]))\*(m[i,j]-m[i,j-1]);}

i:=i+1;

until i=n;

sig[n,j]:=sig[n-1,j];

{sig[n,j]:=sigg[n,j,k];}

{max:=abs((p[0,j]-p[0,j-1]));}

{ for i:=1 to n-1 do

begin

dp[i]:=abs((pp[i,j,k]-pp[i,j,k-1]));

if dp[i]>max then max:=dp[i]; end;

{write(j,' ',k,' ',max:12:12,' ',(pp[0,j,k]):6:6);writeln;}

{until max<0.001;}

{for i:=0 to n do begin p[i,j]:=pp[i,j,k]; sig[i,j]:=sigg[i,j,k] end;}

if trunc((taut\*j)/10)=k2 then begin

gk:=(sp(p[0,j])+(mukp(p[0,j])/mugp(p[0,j]))\*

(fk(sig[0,j])/fq(sig[0,j]))\*ap(p[0,j])\*(p[0,j]/zx(p[0,j]))\*bet\*(1-cp(p[0,j])\*gamp(p[0,j])))/

(1+cp(p[0,j])\*(mukp(p[0,j])/mugp(p[0,j]))\*

(fk(sig[0,j])/fq(sig[0,j]))\*ap(p[0,j])\*(p[0,j]/zx(p[0,j])));

write((taut\*j):2:2,' ',(m[0,j]):4:4,' ',(p[0,j]):2:2,' ',(p[1,j]):2:2,' ',(p[2,j]):2:2,' ',(p[3,j]):2:2,' ',(p[4,j]):2:2,' ',

(p[5,j]):2:2,' ',(p[6,j]):2:2,' ',(p[7,j]):2:2,' ',(p[8,j]):2:2,' ',(p[9,j]):2:2,' ',

(p[10,j]):2:2,' ',(p[11,j]):2:2,' ',(p[12,j]):2:2,' ',(p[13,j]):2:2,' ',(p[14,j]):2:2,' ',(p[15,j]):2:2,' ',

(sig[0,j]):5:5,' ',(sig[1,j]):5:5,' ',(sig[2,j]):5:5,' ',(sig[3,j]):5:5,' ',

sig[4,j]:5:5,' ',sig[5,j]:5:5,' ',sig[6,j]:5:5,' ',sig[7,j]:5:5,' ',sig[8,j]:5:5,' ',sig[9,j]:5:5,' ',sig[10,j]:5:5,' ',

(sig[11,j]):5:5,' ',(sig[12,j]):5:5,' ',(sig[13,j]):5:5,' ',(sig[14,j]):5:5,' ',

sig[15,j]:5:5,' ',(q/gk):2:2,' ',gk:2:2);

writeln; writeln;

write(f,(taut\*j):2:2,' ',' ',(m[0,j]):4:4,' ',(p[0,j]):2:2,' ',(p[1,j]):2:2,' ',(p[2,j]):2:2,' ',(p[3,j]):2:2,' ',(p[4,j]):2:2,' ',

(p[5,j]):2:2,' ',(p[6,j]):2:2,' ',(p[7,j]):2:2,' ',(p[8,j]):2:2,' ',(p[9,j]):2:2,' ',

(p[10,j]):2:2,' ',(p[11,j]):2:2,' ',(p[12,j]):2:2,' ',(p[13,j]):2:2,' ',(p[14,j]):2:2,' ',(p[15,j]):2:2,' ',

(sig[0,j]):5:5,' ',(sig[1,j]):5:5,' ',(sig[2,j]):5:5,' ',(sig[3,j]):5:5,' ',

sig[4,j]:5:5,' ',sig[5,j]:5:5,' ',sig[6,j]:5:5,' ',sig[7,j]:5:5,' ',sig[8,j]:5:5,' ',sig[9,j]:5:5,' ',sig[10,j]:5:5,' ',

(sig[11,j]):5:5,' ',(sig[12,j]):5:5,' ',(sig[13,j]):5:5,' ',(sig[14,j]):5:5,' ',

sig[15,j]:5:5,' ',(m[0,j]):5:5,' ',

m[n,j]:5:5,' ',(q/gk):2:2,' ',gk:2:2);

writeln(f);

k2:=k2+1; end;

j:=j+1;

until p[0,j-1]<10;{(taut\*j/10)>1820000};

close(f);

{TODO -oUser -cConsole Main : Insert code here}

end.