
* PROGRAMME M.N.T (PARTIE CREATION & COMPRESSION) *

```
real rep,xp1,yp1,zp1,test,pente,courbure,orientation
real x,y,xp,yp,zp,z,np,nco,ncs,se,ss,aa,b,na,nb,se1,ymin,ymax
real dd,no,epsilon,determinant,pas,pas1,g,xmin,xmax,denmax
real altitude,dis,zz,np1,m2,m1,nl1,nc1,nl2,nc2,alt,denmin
real pmin,pmax,pmoy,den12,den23,den34,den41,den13,den24,denm
```

*

```
dimension xp(100),yp(100),zp(100),xp1(100),yp1(100),zp1(100)
dimension nop(100),g(15)
```

*

```
character*10 nom,fiche*10,file*10
```

*

```
integer npos,irep,ipos,kpos,nc,n,mm,i,nbb,npt,u
integer ii,jj,sect,np11,m,nop,uu,ns,npi,db,fn
integer j,k,l,pn,nt,nt1,nbr,v,c,kk
```

*

```
common /e1/alt,g,pente,courbure,orientation
common /e2/xp1,yp1,zp1,npt
common /e3/xp,yp,zp,dis(100),sect(100),npi
```

*

```
-----
*                               Maillage
* -----
```

*

1800 continue

```
49 format(//////////, '  ')
```

```
write(*,49)
```

```
write(*,*)'
```

```
write(*,*)'
```

```
write(*,*)'
```

```
write(*,*)'
```

```
write(*,*)'
```

```
write(*,*)'
```

```
write(*,*)'          Generation de la grille.....1'
```

```
write(*,*)'          Interpoler un point.....2'
```

```
write(*,*)'          Sortie.....3'
```

```
64 write(*,3)
```

```
3 format(////,27x,'Choisissez une option',
```

```
* ////,32x,'Option.....:',$)
```

```
read(*,*)rep
```

```
irep=int(rep)
```

```
if(irep.lt.1.or.irep.gt.3)goto 64
```

```
goto(2000,2100,2200),irep
```

*

```
-----
*                               Generation de la grille
* -----
```

*

2000 continue

*

```
-----
*                               Maillage
```

```

* -----
  write(*,65)
65  format('  nom du fichier data comprese')
    read(*,6)nom
6  format(a10)
    open (unit=20,file=nom,status='old',access='direct',
*  form='formatted',recl=80)
    open (unit=50,file='data.mai',status='new',access='direct',
*  form='formatted',recl=80)
    open (unit=30,file='tempo',status='new',access='direct',
*  form='formatted',recl=80)
    write(*,66)
66  format('  nom au fichier noeuds',//,"nom.nod")
    read(*,6)fiche
    open (unit=60,file=fiche,status='new',access='direct',
*  form='formatted',recl=80)
*
    write(*,67)
67  format('  un nom au fichier grille',//,"nom.grl")
    read(*,6)fiche
    open (unit=70,file=fiche,status='new',access='direct',
*  form='formatted',recl=80)
*
*
  write(*,*)'  donnez pas'
    read(*,*)pas
    write(*,*)'  donnez pas1'
    read(*,*)pas1
  write(*,*)'  nombre de points pour l'interpolation  nbb='
    read(*,*)nbb
  write(*,*)'  nombre de secteurs  ns='
    read(*,*)ns
    read(20,15,rec=1)mm,nco,ncs
    ipos=2
    nc=int(nco)
    do 310 j=1,nc
  read(20,15,rec=ipos)mm,z,np
    ipos=ipos+np+1
310  continue
    read(20,15,rec=ipos+1)mm,xmax,xmin
    read(20,15,rec=ipos+2)mm,ymax,ymin
    m2=xmin
    m1=ymin
  se=pas*pas
    aa=ymax-ymin
    b=xmax-xmin
    ss=aa*b
    nl1=aa/pas+1
    nc1=b/pas+1

```

```

        dd=nl1-int(nl1)
    if(dd.gt.0)then
        nl1=int(nl1)+1
    endif
        dd=nc1-int(nc1)
    if(dd.gt.0)then
        nc1=int(nc1)+1
    endif
    nc10=nc1-1
    nl10=nl1-1
    write(*,*)'    nombre de mailles en x et y'
    write(*,*)nc10,nl10
        ipos=2
        npos=2
        nbr=0
62  format(i4,3f10.2)
    do 330 i=1,nc
        read(20,15,rec=ipos)mm,z,np
        if(z.lt.0)then
            ipos=ipos+np+1
            goto 330
        else
            npp=int(np)
            do 320 j=1,npp
                ipos=ipos+1
                read(20,15,rec=ipos)mm,x,y
                if(x.lt.0)then
                    ipos=ipos+1
                    goto 320
                endif
                pn=num(x,y,pas,nc1,xmin,ymin)
                write(30,62,rec=npos)pn,x,y,z
                nbr=nbr+1
                npos=npos+1
320      continue
            endif
            ipos=ipos+1
330      continue
        dd=0
        write(30,62,rec=1)nbr,dd,dd,dd
        nt=nc1*nl1
63  format(3f10.2)
15  format(i4,2f10.2)
    no=1
    ipos=2
    npos=2
    kpos=1
    np=0
    read(30,62,rec=1)nbr,dd,dd,dd

```

```

do 350 j=1,nt
do 340 i=1,nbr
read(30,62,rec=ipos)pn,x,y,z
if(pn.eq.no)then
write(50,63,rec=npos)x,y,z
np=np+1
npos=npos+1
ipos=ipos+1
else
ipos=ipos+1
endif
340 continue
write(50,63,rec=kpos)no,np,dd
no=no+1
kpos=kpos+np+1
np=0
npos=npos+1
ipos=2
350 continue
close(30)

```

```

* -----
*           Interpolation
* -----

```

```

nl2=aa/pas1+1
nc2=b/pas1+1
dd=nl2-int(nl2)
if(dd.gt.0)then
nl2=int(nl2)+1
endif
dd=nc2-int(nc2)
if(dd.gt.0)then
nc2=int(nc2)+1
endif
write(*,*)nl2,nc2
x=xmin1
y=ymin1
xmin=xmin1
ymin=ymin1
nc1=b/pas
nt1=nl2*nc2
write(*,*)nt1,nt,x,y,xmin1,ymin1
write(*,*)' nombre de mailles sur l'axe des x'
write(*,*)nc1

```

```

*
*

```

```

kpos=0
nbr=0
do 360 k=1,int(nl2)
do 370 nc=1,int(nc2)

```

```

      ipos=1
      pn=num(x,y,pas,nc1,xmin,ymin)
      write(*,*)pn
*
*
      ipos=1
      do 380 j=1,nt
      read(50,63,rec=ipos)no,np,dd
      if(pn.eq.no)then
        goto 390
      else
        ipos=ipos+np+1
      endif
380    continue
390    if((pn.eq.1).and.(nbb.le.np))then
      ipos=1
      do 410 i=1,int(np)
      read(50,63,rec=ipos+1)rep,test,dd
      xp1(i)=rep
      yp1(i)=test
      zp1(i)=dd
      ipos=ipos+1
410    continue
*
      npii=0
      call  all secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
      write(*,*)' apres sect'
      write(*,*)npi
      do 420 i=1,npi
      write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
420    continue
229    format(4f8.2,2i5)
      npos=nbb-npi
      if(npos.le.0)then
        goto 4444
      else
      call coin1(nt,nc1,pn)
      write(*,*)' apres coin 1'
*
      do 430 i=i,int(npt)
      write (*,*)xp1(i),yp1(i),zp1(i)
430    continue
*
      write(*,*)npt
      np=npt
      npii=1
      call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
      do 440 i=1,npi
      write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi

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```

440  continue
      goto 4444
      endif
*
      else if((pn.eq.1).and.(nbb.gt.np))then
call coin1(nt,nc1,pn)
*
do 450 i=i,int(np)
write (*,*)xp1(i),yp1(i),zp1(i)
450  continue
*
      write(*,*)npt
      np=npt
      call secteur(xp1,yp1,zp1,x,y,nbb,np,ns)
      do 460 i=1,int(npt)
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
460  continue
*
      goto 4444
      else if((pn.eq.nc1).and.(nbb.le.np))then
      ipos=1
      do 470 i=1,int(np)
        read(50,63,rec=ipos+1)rep,test,dd
        xp1(i)=rep
        yp1(i)=test
        zp1(i)=dd
        ipos=ipos+1
470  continue
      npii=0
      call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
      write(*,*)'  apres sect'
      write(*,*)npi
      do 480 i=1,npi
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
480  continue
      npos=nbb-npi
      if(npos.le.0)then
        goto 4444
      else
call coin2(nt,nc1,pn)
write(*,*)'  apres coin 2'
*
do 490 i=1,int(npt)
write (*,*)xp1(i),yp1(i),zp1(i)
490  continue
*
      write(*,*)npt
      np=npt
      npii=1

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```

        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
        do 510 i=1,np1
        write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
510    continue
*
        goto 4444
        endif
*
*
        else if((pn.eq.nc1).and.(nbb.gt.np))then
        call coin2(nt,nc1,pn)
        write(*,*)' avant affichage '
        np=npt
        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
        do 520 i=1,int(npt)
        write(*,*)xp(i),yp(i),zp(i)
520    continue
*
        goto 4444
*
*
        else if((pn.eq.nc*nc1).and.(nbb.le.np))then
        ipos=1
        do 530 i=1,int(np)
        read(50,63,rec=ipos+1)rep,test,dd
        xp1(i)=rep
        yp1(i)=test
        zp1(i)=dd
        ipos=ipos+1
530    continue
        np1=0
        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
        write(*,*)' apres sect'
        write(*,*)np1
        do 540 i=1,np1
        write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
540    continue
        npos=nbb-np1
        if(npos.le.0)then
        goto 4444
        else
        call coin3(nt,nc1,pn)
        write(*,*)' apres coin 3'
*
        do 550 i=i,int(npt)
        write (*,*)xp1(i),yp1(i),zp1(i)
550    continue
*
        write(*,*)npt

```

```

np=npt
np1=1
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 560 i=1,np1
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
560 continue
*
    goto 4444
endif
*
else if((pn.eq.(nc1*nc1)).and.(nbb.gt.np))then
call coin3(nt,nc1,pn)
    write(*,*)' avant affichage '
    np=npt
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 570 i=1,int(npt)
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
570 continue
    write(*,*)' apres affichage '
*
    goto 4444
*
*
    else if((pn.eq.(nc1*nc1-nc1+1)).and.(nbb.le.np))then
ipos=1
do 580 i=1,int(np)
    read(50,63,rec=ipos+1)rep,test,dd
    xp1(i)=rep
    yp1(i)=test
    zp1(i)=dd
    ipos=ipos+1
580 continue
    np1=0
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
    write(*,*)' apres sect'
    write(*,*)np1
do 590 i=1,np1
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
590 continue
    npos=nbb-np1
    if(npos.le.0)then
        goto 4444
    else
call coin4(nt,nc1,pn)
write(*,*)' apres coin 4'
*
do 610 i=i,int(npt)
write (*,*)xp1(i),yp1(i),zp1(i)
610 continue

```



```

*
    write(*,*)npt
    np=npt
    npii=1
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
    do 620 i=1,npi
    write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
620  continue
*
    goto 4444
    endif
*
    else if((pn.eq.(nc1*nc1-nc1+1)).and.(nbb.gt.np))then
    call coin4(nt,nc1,pn)
    write(*,*)' avant affichage '
    np=npt
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
    do 630 i=1,int(npt)
    write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
630  continue
    write(*,*)' apres affichage '
*
    goto 4444
*
*
    else if((pn.lt.nc1).and.(nbb.le.np))then
    ipos=1
    do 640 i=1,int(np)
    read(50,63,rec=ipos+1)rep,test,dd
    xp1(i)=rep
    yp1(i)=test
    zp1(i)=dd
    ipos=ipos+1
640  continue
    npii=0
    call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
    write(*,*)' apres sect'
    write(*,*)npi
    do 650 i=1,npi
    write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
650  continue
    npos=nbb-npi
    if(npos.le.0)then
    goto 4444
    else
    call cote1(nt,nc1,pn)
    write(*,*)' apres cote 1'
*
    do 660 i=i,int(npt)

```

```

        write (*,*)xp1(i),yp1(i),zp1(i)
660    continue
*
        write(*,*)npt
        np=npt
        npii=1
        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
        do 670 i=1,np1
        write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
670    continue
*
        goto 4444
        endif
*
        else if((pn.lt.nc1).and.(nbb.gt.np))then
        call cote1(nt,nc1,pn)
        write(*,*)' avant affichage '
        np=npt
        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
        do 680 i=1,int(npt)
        write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
680    continue
        write(*,*)' apres affichage '
*
        goto 4444
*
*
        else if((((pn/nc1)-int(pn/nc1)).eq.0).and.(nbb.le.np))then
        ipos=1
        do 690 i=1,int(np)
        read(50,63,rec=ipos+1)rep,test,dd
        xp1(i)=rep
        yp1(i)=test
        zp1(i)=dd
        ipos=ipos+1
690    continue
        npii=0
        call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
        write(*,*)' apres sect'
        write(*,*)npi
        do 710 i=1,np1
        write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
710    continue
        npos=nbb-npi
        if(npos.le.0)then
        goto 4444
        else
        call cote2(nt,nc1,pn)
        write(*,*)' apres cote 2'

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```

*
do 720 i=i,int(npt)
write (*,*)xp1(i),yp1(i),zp1(i)
720 continue
*
write(*,*)npt
np=npt
np1=1
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 730 i=1,np1
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
730 continue
*
goto 4444
endif
*
else if((((pn/nc1)-int(pn/nc1)).eq.0).and.(nbb.gt.np))then
call cote2(nt,nc1,pn)
write(*,*)' avant affichage '
np=npt
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 740 i=1,int(npt)
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
740 continue
write(*,*)' apres affichage '
*
goto 4444
*
*
else if((((int(pn/nc1)*nc1+1).eq.pn).and.(nbb.le.np))then
ipos=1
do 750 i=1,int(np)
read(50,63,rec=ipos+1)rep,test,dd
xp1(i)=rep
yp1(i)=test
zp1(i)=dd
ipos=ipos+1
750 continue
np1=0
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
write(*,*)' apres sect'
write(*,*)np1
do 760 i=1,np1
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),np1
760 continue
npos=nbb-np1
if(npos.le.0)then
goto 4444
else

```

```

call cote3(nt,nc1,pn)
write(*,*)'  apres cote 3'
*
do 770 i=1,int(npt)
write (*,*)xp1(i),yp1(i),zp1(i)
770  continue
*
write(*,*)npt
np=npt
npii=1
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
do 780 i=1,np
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
780  continue
*
goto 4444
endif
*
else if(((int(pn/nc1)*nc1+1).eq.pn).and.(nbb.gt.np))then
call cote3(nt,nc1,pn)
write(*,*)'  avant affichage '
np=npt
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
do 790 i=1,int(npt)
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
790  continue
write(*,*)'  apres  affichage '
*
goto 4444
*
*
else if((pn.gt.(nc1*nc1-nc1+1)).and.(nbb.le.np))then
ipos=1
do 810 i=1,int(np)
read(50,63,rec=ipos+1)rep,test,dd
xp(i)=rep
yp(i)=test
zp(i)=dd
ipos=ipos+1
810  continue
*
npii=0
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
write(*,*)'  apres sect'
write(*,*)npi
do 820 i=1,np
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
820  continue
npos=nbb-npi

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        if(npos.le.0)then
            np=npt
            goto 4444
        else
            call cote4(nt,nc1,pn)
            write(*,*)'  apres cote 4'
*
        do 830 i=i,int(npt)
            write (*,*)xp1(i),yp1(i),zp1(i)
830    continue
*
            write(*,*)npt
            np=npt
            npii=1
            call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
            do 840 i=1,np
                write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
840    continue
*
            goto 4444
            endif
*
        else if((pn.gt.(nc1*nc1-nc1+1)).and.(nbb.gt.np))then
            call cote4(nt,nc1,pn)
            write(*,*)'  avant affichage '
            np=npt
            call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
            do 850 i=1,int(npt)
                write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
850    continue
            write(*,*)'  apres affichage '
*
            goto 4444
*
*
        else if(nbb.le.np)then
            ipos=1
            do 860 i=1,int(np)
                read(50,63,rec=ipos+1)rep,test,dd
                xp1(i)=rep
                yp1(i)=test
                zp1(i)=dd
                ipos=ipos+1
860    continue
*
            npii=0
            call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,npii)
            write(*,*)'  apres sect'
            write(*,*)npi

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```

do 870 i=1,npi
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
870 continue
npos=nbb-npi
if(npos.le.0)then
goto 4444
else
call milieu(nt,nc1,pn)
write(*,*)' apres milieu'
*
do 880 i=i,int(npt)
write(*,*)xp1(i),yp1(i),zp1(i)
880 continue
*
write(*,*)npt
np=npt
np1=1
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 890 i=1,npi
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i),npi
890 continue
*
goto 4444
endif
*
else if(nbb.gt.np)then
call milieu(nt,nc1,pn)
write(*,*)' avant affichage '
np=npt
call secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np1)
do 920 i=1,int(npt)
write(*,229)xp(i),yp(i),zp(i),dis(i),sect(i)
920 continue
write(*,*)' apres affichage '
*
goto 4444
endif
*
*
4444 np=nbb
call gauss(xp,yp,zp,np,x,y)
do 910 i=1,6
write(*,*)g(i)
910 continue
nbr=nbr+1
kpos=kpos+1
write(*,*)nbr,x,y,alt,pente,courbure,orientation
write(60,68,rec=kpos)nbr,x,y,alt,pente,courbure,orientation
x=x+pas1

```

```

370  continue
      y=y+pas1
      x=m2
360  continue
      close(50)
68   format(i4,2x,3f9.3,2x,f11.5,2x,f11.5,2x,f11.5)
*   -----
*               Grille reguliere
*   -----

      read(20,15,rec=1)mm,nco,ncs
      ipos=2
      nc=int(nco)
      do 950 j=1,nc
        read(20,15,rec=ipos)mm,z,np
        ipos=ipos+np+1
950   continue
      read(20,15,rec=ipos+1)mm,xmax,xmin
      read(20,15,rec=ipos+2)mm,ymax,ymin
*
      aa=ymax-ymin
      b=xmax-xmin
      nl2=aa/pas1+1
      nc2=b/pas1+1
      aaa=nl2-int(nl2)
      bbb=nc2-int(nc2)
      if(aaa.gt.0)then
        nl2=int(nl2)+1
      endif
      if(bbb.gt.0)then
        nc2=int(nc2)+1
      endif
*
69   format(5i4)
      npos=0
      ii=1
      i=1
      j=2
      k=nc2+1
      u=nc2+2
      do 940 n=1,int(nl2)
        npos=npos+1
        write(70,69,rec=npos)ii,i,j,k,u
        do 930 nc=1,int(nc2)-1
          i=i+1
          j=j+1
          k=k+1
          u=u+1
          ii=ii+1
          npos=npos+1

```

```

        write(70,69,rec=npos)ii,i,j,k,u
930  continue
        i=i+2
        j=j+2
        k=k+2
        u=u+2
        ii=ii+1
940  continue
        close(20)
* -----
*
*          fichier rectangle
* -----
        write(*,76)
76  format(' un nom au fichier rectangle',//,'"nom.rec"')
        read(*,6)nom
        open (unit=15,file=nom,status='new',access='direct',
*  form='formatted',recl=80)
        nl2=nl2-1
        nc2=nc2-1
        nt1=nl2*nc2
        ipos=1
        do 10 nc=1,nt1
pmoy=0
        read(70,69,rec=nc)ii,i,j,k,u
        read(60,68,rec=i)nbr,x,y,alt1,pente,courbure,orientation
        pmax=pente
        pmin=pente
        pmoy=pmoy+pente
        read(60,68,rec=j)nbr,x,y,alt2,pente,courbure,orientation
        if(pente.gt.pmax)then
            pmax=pente
        endif
        if(pente.lt.pmin)then
            pmin=pente
        endif
        pmoy=pmoy+pente
*
        read(60,68,rec=u)nbr,x,y,alt3,pente,courbure,orientation
        if(pente.gt.pmax)then
            pmax=pente
        endif
        if(pente.lt.pmin)then
            pmin=pente
        endif
        pmoy=pmoy+pente
*
        read(60,68,rec=k)nbr,x,y,alt4,pente,courbure,orientation
        if(pente.gt.pmax)then
            pmax=pente

```



```

endif
  if(pente.lt.pmin)then
    pmin=pente
  endif
  pmoy=pmoy+pente
*
denm=0
den12=abs(alt1-alt2)
denm=denm+den12
denmax=den12
denmin=den12
*
den23=alt2-alt3
denm=denm+den23
if(den23.gt.denmax)then
  denmax=den23
endif
if(den23.lt.denmin)then
  denmin=den23
endif
*
den34=alt3-alt4
denm=denm+den34
if(den34.gt.denmax)then
  denmax=den43
endif
if(den43.lt.denmin)then
  denmin=den43
endif
*
den41=alt4-alt1
denm=denm+den41
if(den41.gt.denmax)then
  denmax=den41
endif
if(den41.lt.denmin)then
  denmin=den41
endif
*
den13=alt1-alt3
denm=denm+den13
if(den13.gt.denmax)then
  denmax=den13
endif
if(den13.lt.denmin)then
  denmin=den13
endif
*
den24=alt2-alt4

```

```

denm=denm+den24
if(den24.gt.denmax)then
  denmax=den24
endif
if(den24.lt.denmin)then
  denmin=den24
endif
*
  write(15,74,rec=ipos)ii,pmin,pmax,pmoy,denmin,denmax,denm
  write(15,74,rec=ipos+1)ii,den12,den23,den34,den41*den13,den24
  ipos=ipos+2
74  format(i4,2x,6(1x,f11.4))
  write(*,74)ii,pmin,pmax,pmoy,denmin,denmax,denm
  write(*,74)ii,den12,den23,den34,den41*den13,den24
10  continue
  close(15)
  close(70)
  close(60)
  goto 1800
*
* -----
*   INTERPOLER UN POINT
* -----
2100 continue
*
  write(*,65)
  read(*,6)nom
  open (unit=20,file=nom,status='old',access='direct',
*  form='formatted',recl=80)
*
  write(*,71)
71  format('  rappeler le nom du fichier noeuds',//,"nom.nod")
  read(*,6)fiche
  open (unit=60,file=fiche,status='old',access='direct',
*  form='formatted',recl=80)
*
  write(*,72)
72  format('  rappeler le nom du fichier grille',//,"nom.grl")
  read(*,6)fiche
  open (unit=70,file=fiche,status='old',access='direct',
*  form='formatted',recl=80)
*
  write(*,*)' rapeler le pas '
  read(*,*)pas
  write(*,*)'    x    y    '
  read(*,*)x
  read(*,*)y
  read(20,15,rec=1)mm,nco,ncs
  ipos=2

```

```

        nc=int(nco)
        do 960 j=1,nc
            read(20,15,rec=ipos)mm,z,np
            ipos=ipos+np+1
960    continue
            read(20,15,rec=ipos+1)mm,xmax,xmin
            read(20,15,rec=ipos+2)mm,ymax,ymin
*
            aa=ymax-ymin
            b=xmax-xmin
            nl2=aa/pas+1
            nc2=b/pas+1
            aaa=nl2-int(nl2)
            bbb=nc2-int(nc2)
            if(aaa.gt.0)then
                nl2=int(nl2)+1
            endif
            if(bbb.gt.0)then
                nc2=int(nc2)+1
            endif
*
            altitude=0
            pente1=0
            courbure1=0
            orientation1=0
            nc1=nc2
            pn=num(x,y,pas,nc1,xmin,ymin)
*
            read(70,69,rec=pn)nc,ii,jj,kk,uu
            read(60,68,rec=ii)nbr,x,y,z,pente,courbure,orientation
*
            altitude=altitude+z
            pente1=pente1+pente
            courbure1=courbure1+courbure
            orientation1=orientation1+orientation
*
            read(60,68,rec=jj)nbr,x,y,z,pente,courbure,orientation
            altitude=altitude+z
            pente1=pente1+pente
            courbure1=courbure1+courbure
            orientation1=orientation1+orientation
*
            read(60,68,rec=kk)nbr,x,y,z,pente,courbure,orientation
            altitude=altitude+z
            pente1=pente1+pente
            courbure1=courbure1+courbure
            orientation1=orientation1+orientation
*
            read(60,68,rec=uu)nbr,x,y,z,pente,courbure,orientation

```

```

altitude=altitude+z
pente1=pente1+pente
courbure1=courbure1+courbure
orientation1=orientation1+orientation
*

close(60)
close(20)
close(70)
*

altitude=altitude/4
pente=pente1/4
courbure=courbure1/4
orientation=orientation1/4
write(*,*) ALTITUDE = ',altitude
write(*,*) PENTE = ',pente
write(*,*) COURBNRE = ',courbure
write(*,*) ORIENTATION = ',orientation
18 write(*,44)
44 format(///,15x,'Pour retourner au menu presser sur 1 et valider')
read(*,*)m
if(m.ne.1)then
goto 18
else
goto 1800
endif
goto 1800
2200 stop
end
*
*
* -----
* subroutine Gauss
* -----

subroutine gauss(xp,yp,zp,np,x,y)
dimension a(15,15),w(15,15),p(15),l(15),p1(15,15),p2(15)
dimension xp(100),yp(100),zp(100),g(15),h(15),ta(15,15),pp(15,15)
integer i,j,k,s,n,l
common /e1/alt,g,pente,courbure,orientation
real a,g,p,epsilon,determinant,p1,p2,x,y,alt,q,pp,ta
real xp,yp,zp,np
parameter (pi=3.141592654)
double precision r,w
epsilon=1E-4
* -----
*
* mat A
* -----

do 232 i=1,int(np)
if((xp(i).eq.x).or.(yp(i).eq.y))then
xp(i)=xp(i)+1E-2

```

```

    yp(i)=yp(i)+1E-2
endif
    a(i,1)=1
    a(i,2)=xp(i)
    a(i,3)=yp(i)
    a(i,4)=xp(i)*yp(i)
    a(i,5)=xp(i)*xp(i)
    a(i,6)=yp(i)*yp(i)
232 continue
do 556 i=1,int(np)
    write(*,51)a(i,1),a(i,2),a(i,3),a(i,4),a(i,5),a(i,6)
556 continue
write(*,*)' coefficients matrice w'
j=1
do 330 i=1,int(np)
    w(i,j)=1/(sqrt((xp(i)-x)**2+(yp(i)-y)**2))
    j=j+1
330 continue
do 555 i=1,int(np)
    write(*,51)w(i,1),w(i,2),w(i,3),w(i,4),w(i,5),w(i,6),w(i,7)
555 continue
51 format(8f10.2)
write(*,*)' coefficients matrice h'
do 62 i=1,int(np)
    h(i)=zp(i)
62 continue
do 546 i=1,int(np)
    write(*,12)h(i)
546 continue
12 format(3x,f12.2)
*
*      TRANSPOSITION DE LA MATRICE A
*
* do 100 i=1,6
* do 110 j=1,int(np)
*   ta(i,j)=a(j,i)
* 110 continue
* 100 continue
*
* IMPRESSION DU RESULTAT
*
* write(*,*)' matrice transposee '
* do 557 i=1,6
*   write(*,51)ta(i,1),ta(i,2),ta(i,3),ta(i,4),ta(i,5),ta(i,6),
*   *ta(i,7),ta(i,8),ta(i,9),ta(i,10),ta(i,11),ta(i,12)
* 557 continue
* -----
*      LINEARISATION
* -----

```

```

*
*          PRODUIT pp=ta*w
*
      do 54 i=1,6
      do 64 j=1,int(np)
      q=0
      do 70 k=1,int(np)
      q=q+a(i,k)*w(k,j)
      pp(i,j)=q
70  continue
64  continue
54  continue
*          IMPRESSION DU RESULTAT
*
      write(*,*) '  matrice produit pp=ta*w'
      do 558 i=1,6
      write(*,51)pp(i,1),pp(i,2),pp(i,3),pp(i,4),pp(i,5),pp(i,6)
558  continue
*
*          PRODUIT P1=ta*w*a
*
*      do 53 i=1,6
*      do 61 j=1,int(np)
*      q=0
*      do 71 k=1,int(np)
*      q=q+pp(i,k)*a(k,j)
*      p1(i,j)=q
* 71  continue
* 61  continue
* 53  continue
*
*          IMPRESSION DU RESULTAT
*
*      write(*,*) '  matrice produit p1=ta*w*A'
*      do 559 i=1,6
*      write(*,51)p1(i,1),p1(i,2),p1(i,3),p1(i,4),p1(i,5),p1(i,6)
* 559  continue
*
*          PRODUIT P2=ta*w*h
*
*      do 52 i=1,6
*      do 67 j=1,int(np)
*      q=0
*      do 72 k=1,int(np)
*      q=q+pp(i,k)*h(k)
*      p2(i)=q
* 72  continue
* 67  continue
* 52  continue

```

```

*
*      IMPRESSION DU RESULTAT
*
*  write(*,*)'  matrice produit p2=ta*w*h'
*      do 549 i=1,6
*          write(*,12)p2(i)
* 549  continue
*          write(*,*)'  coefficients matrice a augmentee'
*          do 181 i=1,6
*              do 201 j=1,6
*                  a(i,j)=pp(i,j)
201  continue
*                  a(i,7)=h(i)
181  continue
*                  do 449 i=1,6
*                      write(*,13)a(i,1),a(i,2),a(i,3),a(i,4),a(i,5),a(i,6),a(i,7)
449  continue
13  format(7f10.2)
*      n=6
*      do 410 k=1,n-1
*
*      -----
*      recherche du kieme pivot -> p(k)
*      -----
*
*          p(k)=0
*          do 510 i=1,n
*              if(k.gt.1)then
*                  do 610 s=1,k-1
*                      if(i.eq.l(s)) goto 510
610  continue
*                  endif
*                  if(abs(p(k)).lt.abs(a(i,k)))then
*                      p(k)=a(i,k)
*                      l(k)=i
*                  endif
510  continue
*                  if(abs(p(k)).lt.epsilon)then
*                      write(*,*)'pivot=',p(k),' < epsilon'
*                  endif
*
*      -----
*      triangularisation: AX=B --> UX=B
*      -----
*
*          do 710 i=1,n
*              do 810 s=1,k
*                  if(i.eq.l(s))goto 710
810  continue
*              l(n)=i
*              r=a(i,k)/p(k)
*              do 910 j=k,n+1
*                  a(i,j)=a(i,j)-r*a(l(k),j)

```

```

910     continue
710  continue
410  continue
*  -----
*  resolution du system ... matrice triangulaire superieure: UX=B
*  -----
      p(n)=a(l(n),n)
      g(n)=a(l(n),n+1)/p(n)
      do 122 i=n-1,1,-1
g(i)=a(l(i),n+1)
      do 116 j=i+1,n
        g(i)=g(i)-a(l(i),j)*g(j)
116  continue
      g(i)=g(i)/p(i)
122  continue
*  -----
*  calcul du determinant
*  -----
      determinant=p(1)
      do 127 k=2,n
        determinant=determinant*p(k)
127  continue
*  IMPRESSION DU RESULTAT
      alt=g(1)+g(2)*x+g(3)*y+g(4)*x*y+g(5)*x*x+g(6)*y*y
      der1x=g(2)+g(4)*y+2*g(5)*x
      der1y=g(3)+g(4)*x+2*g(6)*y
      der2x=2*g(5)
      der2y=2*g(6)
      der2xy=g(4)
      pente=sqrt((der1x*der1x)+(der1y*der1y))
      courbure=der2x+der2y
      orientation=atan(der1y/der1x)
      orientation=(orientation*200)/pi
      do 147 i=1,6
        write(*,*)g(i)
147  continue
      write(*,*)'  altitude=',alt,pente,courbure,orientation
      return
      end
*
*  -----
*
*  function num (X,Y) ==> (N)
*  -----
      function num(x,y,pas,nc1,xmin,ymin)
      real x,y,z,xmin,ymin,pas,nc1
      ni=int((x-xmin)/pas)
      nj=int((y-ymin)/pas)
      num=nc1*nj+ni+1
      return

```


end

```
* -----
*      subroutine coin1
*      -----
      subroutine coin1(nt,nc1,pn)
      real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
      common /e2/xp1(100),yp1(100),zp1(100),npt
      integer ipos,i,j,nt,pn,npt,sect,nbb
      ipos=1
      npt=0
      n=0
      a=pn+nc1
      b=a+1
      write(*,*)'   je suis dans coin 1 les cases sont 1 ,2 et '
      write(*,*)a,b
      do 1 j=1,nt
        read(50,15,rec=ipos)no,np,dd
        pp=np
        if(no.eq.1.or.no.eq.2.or.no.eq.a.or.no.eq.b)then
          ipos=ipos+1
          np=n+np
        do 2 i=n+1,int(np)
          read(50,15,rec=ipos)xx,yy,zz
          xp1(i)=xx
          yp1(i)=yy
          zp1(i)=zz
          ipos=ipos+1
        2  continue
        npt=npt+pp
        n=n+pp
      else
        ipos=ipos+pp+1
      endif
    1  continue
      do 3 i=1,int(npt)
        write(*,*)xp1(i),yp1(i),zp1(i)
    3  continue
15  format(3f10.2)
      return
      end
```

```
* -----
*      subroutine coin2
*      -----
      subroutine coin2(nt,nc1,pn)
      real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
      common /e2/xp1(100),yp1(100),zp1(100),npt
      integer ipos,i,j,nt,pn,npt,sect,nbb
      ipos=1
      npt=0
```

```

n=0
pn=nc1+nc1
b=nc1-1
c=pn-1
write(*,*)'   je suis dans coin 2 les cases sont '
write(*,*)pn,nc1,b,c
do 1 j=1,nt
read(50,15,rec=ipos)no,np,dd
pp=np
if((no.eq.nc1).or.(no.eq.(nc1-1)).or.(no.eq.pn).or.
*(no.eq.(pn-1)))then
ipos=ipos+1
np=n+np
do 2 i=n+1,int(np)
read(50,15,rec=ipos)xx,yy,zz
xp1(i)=xx
yp1(i)=yy
zp1(i)=zz
ipos=ipos+1
2 continue
npt=npt+pp
n=n+pp
else
ipos=ipos+pp+1
endif
1 continue
do 3 i=1,int(npt)
write(*,*)xp1(i),yp1(i),zp1(i)
3 continue
15 format(3f10.2)
return
end

```

```

* -----
*   subroutine coin3
*   -----

```

```

subroutine coin3(nt,nc1,pn)
real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
common /e2/xp1(100),yp1(100),zp1(100),npt
integer ipos,i,j,nt,pn,npt,sect,nbb
ipos=1
npt=0
n=0
pn=nc1*nc1
a=pn-nc1-1
b=pn-1
c=pn-nc1
write(*,*)'   je suis dans coin 3 les cases sont '
write(*,*)pn,a,b,c
do 1 j=1,nt

```

```

    read(50,15,rec=ipos)no,np,dd
    pp=np
    if((no.eq.pn).or.(no.eq.b).or.(no.eq.a).or.(no.eq.c))then
    ipos=ipos+1
    np=n+np
do 2 i=n+1,int(np)
    read(50,15,rec=ipos)xx,yy,zz
    xp1(i)=xx
    yp1(i)=yy
    zp1(i)=zz
    ipos=ipos+1
2    continue
    npt=npt+pp
    n=n+pp
else
    ipos=ipos+pp+1
endif
1    continue
    do 3 i=1,int(npt)
write(*,*)xp1(i),yp1(i),zp1(i)
3    continue
15    format(3f10.2)
    return
end

```

```

* -----
*      subroutine coin4
* -----

```

```

subroutine coin4(nt,nc1,pn)
real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
common /e2/xp1(100),yp1(100),zp1(100),npt
integer ipos,i,j,nt,pn,npt,sect,nbb
ipos=1
npt=0
n=0
pn=nc1*nc1-nc1+1
a=pn+1
b=pn-nc1
c=pn-nc1+1
write(*,*)'    je suis dans coin 4 les cases sont '
write(*,*)pn,a,b,c
if((no.eq.pn).or.(no.eq.a).or.(no.eq.b).or.(no.eq.c))then
ipos=ipos+1
np=n+np
do 2 i=n+1,int(np)
    read(50,15,rec=ipos)xx,yy,zz
    xp1(i)=xx
    yp1(i)=yy
    zp1(i)=zz
    ipos=ipos+1

```

```

2   continue
    npt=npt+pp
    n=n+pp
else
    ipos=ipos+pp+1
endif
1   continue
    do 3 i=1,int(npt)
    write(*,*)xp1(i),yp1(i),zp1(i)
3   continue
15  format(3f10.2)
    return
    end

* -----
*   subroutine cote1
* -----

subroutine cote1(nt,nc1,pn)
real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
common /e2/xp1(100),yp1(100),zp1(100),npt
integer ipos,i,j,nt,pn,npt,sect,nbb
ipos=1
npt=0
n=0
a=pn-1
b=pn+nc1
c=b+1
f=b-1
e=pn+1
write(*,*) '   je suis dans cote 1 les cases sont '
write(*,*)pn,a,b,c,f,e
do 1 j=1,nt
read(50,15,rec=ipos)no,np,dd
pp=np
if(no.lt.pn.or.no.eq.a.or.no.eq.b.or.no.eq.c.or.
*no.eq.f.or.no.eq.e)then
    ipos=ipos+1
    np=n+np
do 2 i=n+1,int(np)
    read(50,15,rec=ipos)xx,yy,zz
    xp1(i)=xx
    yp1(i)=yy
    zp1(i)=zz
    ipos=ipos+1
2   continue
    npt=npt+pp
    n=n+pp
else
    ipos=ipos+pp+1
endif

```

```

1  continue
    do 3 i=1,int(npt)
    write(*,*)xp1(i),yp1(i),zp1(i)
3  continue
15 format(3f10.2)
    return
    end

* -----
*      subroutine cote2
* -----

subroutine cote2(nt,nc1,pn)
  real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
  common /e2/xp1(100),yp1(100),zp1(100),npt
  integer ipos,i,j,nt,pn,npt,sect,nbb
  ipos=1
  npt=0
  n=0
  a=pn-nc1
  b=a-1
  c=pn-1
  f=pn+nc1
  e=f-1
  write(*,*)'    je suis dans cote 2 les cases sont '
  write(*,*)pn,a,b,c,f,e
  do 1 j=1,nt
    read(50,15,rec=ipos)no,np,dd
    pp=np
    if(no.lt.pn.or.no.eq.a.or.no.eq.b.or.no.eq.c.or.
*no.eq.f.or.no.eq.e)then
      ipos=ipos+1
      np=n+np
    do 2 i=n+1,int(np)
      read(50,15,rec=ipos)xx,yy,zz
      xp1(i)=xx
      yp1(i)=yy
      zp1(i)=zz
      ipos=ipos+1
2    continue
      npt=npt+pp
      n=n+pp
    else
      ipos=ipos+pp+1
    endif
1  continue
    do 3 i=1,int(npt)
    write(*,*)xp1(i),yp1(i),zp1(i)
3  continue
15 format(3f10.2)
    return

```

end

```
* -----  
*      subroutine cote3  
* -----  
      subroutine cote3(nt,nc1,pn)  
      real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1  
      common /e2/xp1(100),yp1(100),zp1(100),npt  
      integer ipos,i,j,nt,pn,npt,sect,nbb  
      ipos=1  
      npt=0  
      n=0  
      a=pn+1  
      b=pn-nc1  
      c=pn+nc1  
      f=c+1  
      e=b+1  
      write(*,*) ' je suis dans cote 3 les cases sont '  
      write(*,*)pn,a,b,c,f,e  
      do 1 j=1,nt  
      read(50,15,rec=ipos)no,np,dd  
      pp=np  
      if(no.lt.pn.or.no.eq.a.or.no.eq.b.or.no.eq.c.or.  
*no.eq.f.or.no.eq.e)then  
      ipos=ipos+1  
      np=n+np  
      do 2 i=n+1,int(np)  
      read(50,15,rec=ipos)xx,yy,zz  
      xp1(i)=xx  
      yp1(i)=yy  
      zp1(i)=zz  
      ipos=ipos+1  
2      continue  
      npt=npt+pp  
      n=n+pp  
      else  
      ipos=ipos+pp+1  
      endif  
1      continue  
      do 3 i=1,int(npt)  
      write(*,*)xp1(i),yp1(i),zp1(i)  
3      continue  
15     format(3f10.2)  
      return  
      end
```

```
* -----  
*      subroutine cote4  
* -----  
      subroutine cote4(nt,nc1,pn)  
      real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
```

```

common /e2/xp1(100),yp1(100),zp1(100),npt
integer ipos,i,j,nt,pn,npt,sect,nbb
ipos=1
npt=0
n=0
a=pn+1
b=pn-1
c=pn-nc1
f=c+1
e=c-1
write(*,*) ' je suis dans cote 4 les cases sont '
write(*,*)pn,a,b,c,f,e
do 1 j=1,nt
read(50,15,rec=ipos)no,np,dd
pp=np
if(no.lt.pn.or.no.eq.a.or.no.eq.b.or.no.eq.c.or.
*no.eq.f.or.no.eq.e)then
ipos=ipos+1
np=n+np
do 2 i=n+1,int(np)
read(50,15,rec=ipos)xx,yy,zz
xp1(i)=xx
yp1(i)=yy
zp1(i)=zz
ipos=ipos+1
2 continue
npt=npt+pp
n=n+pp
else
ipos=ipos+pp+1
endif
1 continue
do 3 i=1,int(npt)
write(*,*)xp1(i),yp1(i),zp1(i)
3 continue
15 format(3f10.2)
return
end

```

* -----

* subroutine milieu

* -----

```

subroutine milieu(nt,nc1,pn)
real xx,yy,zz,no,np,dd,x,y,dis,xp1,yp1,zp1,nc1
common /e2/xp1(100),yp1(100),zp1(100),npt
integer ipos,i,j,nt,pn,npt,sect,nbb
ipos=1
npt=0
n=0
a=pn+1

```

```

b=pn-1
c=pn-nc1
q=pn+nc1
e=c-1
f=q+1
g=q-1
h=c+1
write(*,*) ' je suis dans milieu les cases sont '
write(*,*)pn,a,b,c,q,e,f,g,h
do 1 j=1,nt
read(50,15,rec=ipos)no,np,dd
pp=np
if(no.lt.pn.or.no.eq.a.or.no.eq.b.or.no.eq.
*c.or.no.eq.q.or.no.eq.e.or.no.eq.f.or.
*no.eq.g.or.no.eq.h)then
ipos=ipos+1
np=n+np
do 2 i=n+1,int(np)
read(50,15,rec=ipos)xx,yy,zz
xp1(i)=xx
yp1(i)=yy
zp1(i)=zz
ipos=ipos+1
2 continue
npt=npt+pp
n=n+pp
else
ipos=ipos+pp+1
endif
1 continue
do 3 i=1,int(npt)
write(*,*)xp1(i),yp1(i),zp1(i)
3 continue
15 format(3f10.2)
return
end

```

*

* -----

* subrountine sectri

* -----

```

subrountine secteur(xp1,yp1,zp1,x,y,nbb,np,ns,np11)
real list,dist,kelt,a,b,x,y,xp,yp,zp,np,teta,tetapt,dis
real vv,ff,xx,xp1,yp1,zp1,d,epsilon
common /e3/xp(100),yp(100),zp(100),dis(100),sect(100),npi
dimension xp1(100),yp1(100),zp1(100),d(100),s(100)
integer n,k,lb,ihb,milieu,i,nbb,nsp,sect
integer bb,npt,ns,v,npi,j,s,np11
parameter (pi=3.141592654)
write(*,*) ' secteur '

```



```

        epsilon=.01
        do 55 i=1,int(np)
            write(*,36)xp1(i),yp1(i),zp1(i),x,y,nbb
55      continue
36      format(5f10.2,i5)
            v=1
            do 601 i=v,int(np)
                a=xp1(i)-x
                b=yp1(i)-y
                if(a.eq.0)then
                    a=epsilon
                else if(b.eq.0)then
                    b=epsilon
                endif
                dis(i)=sqrt(a*a+b*b)
                teta=(2*pi)/ns
                dist=teta
                tetapt=atan(b/a)
                if((a.gt.0).and.(b.gt.0))then
                    tetapt=tetapt
                    goto 1501
                else if((a.le.0).and.(b.le.0))then
                    tetapt=abs(tetapt)+pi
                    goto 1501
                else if((a.gt.0).and.(b.lt.0))then
                    tetapt=pi+pi-abs(tetapt)
                    goto 1501
                else if((a.lt.0).and.(b.gt.0))then
                    tetapt=pi-abs(tetapt)
                    goto 1501
                endif
1501      nsp=1
1502      list=tetapt-teta
                if(list.le.0)then
                    nsp=nsp
                    sect(i)=nsp
                    goto 601
                else
                    teta=teta+dist
                    nsp=nsp+1
                    goto 1502
                endif
601      continue
            do 602 i=1,int(np)
                write(*,66)dis(i),xp1(i),yp1(i),zp1(i),sect(i)
67      format(4f8.2,i5)
602      continue
            write(*,*)np
            do 1 k=2,int(np)

```

```

kelt=dis(k)
bb=sect(k)
vv=xp1(k)
ff=yp1(k)
xx=zp1(k)
lb=0
ihb=k
2  continue
    milieu=(lb+ihb)/2
    if(dis(milieu).le.kelt)then
        lb=milieu
    else
        ihb=milieu
    endif
    if(ihb-lb.gt.1) goto 2
    do 3 i=k,ihb+1,-1
        dis(i)=dis(i-1)
        sect(i)=sect(i-1)
        xp1(i)=xp1(i-1)
        yp1(i)=yp1(i-1)
3    zp1(i)=zp1(i-1)
    dis(ihb)=kelt
    sect(ihb)=bb
    xp1(ihb)=vv
    yp1(ihb)=ff
    zp1(ihb)=xx
1  continue
    write(*,*)' vecteur trie'
    do 5 i=1,int(np)
        xp(i)=xp1(i)
        yp(i)=yp1(i)
        zp(i)=zp1(i)
        write(*,67)xp(i),yp(i),zp(i),dis(i),sect(i)
5  continue
66  format(4f12.2,4x,i2)
    j=1
    k=1
    npi=0
    i=1
12  if(j.ge.np)goto 15
    ff=k-int(np)
    if(ff.gt.0)goto 16
    if(dis(k).eq.0)then
        k=k+1
        goto 12
    endif
    write(*,*)k,ff
    vv=i-sect(k)
    if(vv.eq.0)then

```

```

d(j)=dis(k)
s(j)=sect(k)
xp1(j)=xp(k)
yp1(j)=yp(k)
zp1(j)=zp(k)
dis(k)=0
npi=npi+1
write(*,*)xp1(j),yp1(j),zp1(j),d(j),s(j),npi
j=j+1
i=i+1
k=1
goto 12
else
k=k+1
goto 12
endif
16  write(*,*)k,n,i,npi
    if(npi.lt.ns.and.npii.eq.0)then
        goto 15
    else if(npi.lt.nbb.and.i.le.ns)then
        k=1
        i=i+1
        goto 12
    else if(npi.lt.nbb)then
        k=1
        i=1
        goto 12
    endif
15  write(*,*)' vecteur trie et arrange'
    do 9 i=1,npi
        dis(i)=d(i)
        sect(i)=s(i)
        xp(i)=xp1(i)
        yp(i)=yp1(i)
        zp(i)=zp1(i)
        write(*,69)xp(i),yp(i),zp(i),dis(i),sect(i),npi
9    continue
    write(*,*)npi
69  format(4f10.5,2i5)
    return
end

```

C
C TRANSFORMATION DE COORDONNEES
C LAMBERT--->GEOG. ET GEOG--->UTM
C

```
IMPLICIT DOUBLE PRECISION (A-H,O-Z)
CHARACTER*15 NFICS
WRITE(*,123)
123  FORMAT(22(/) ' *** CHOIX DE LA TRANSFORMATION ***' //,
* ' *** LAMBERT ----->GEOG.      1 ',//,
* ' *** GEOG.----->LAMB.      2 ',//,
* ' *** LAMBERT ----->UTM      3 ',//,
* ' *** UTM----->LAMB      4 ',//,
* ' *** GEOG.----->UTM      5 ',//,
* ' *** UTM----->GEOG      6 ',//,$)
READ(*,10)ICH
10  format(i1)
WRITE(*,20)
20  FORMAT(/,' NOM DU FICHIER DE SORTIE ? : ', $)
READ(*,15)NFICS
15  FORMAT(A15)
OPEN(2,FILE=NFICS,STATUS='NEW')
    if(ich.eq.1)then
        write(2,30)
30  format(' *** LAMBERT ----->GEOG ***')
        WRITE(*,61)
61  format(' Rang No point Xlambert(VLU) Ylambert(VLU)')
        WRITE(2,41)
41  format('Rang No point Xlambert(VLU) Ylambert(VLU)
* Longitude Latitude')
        else
            if(ich.eq.2)then
                write(2,31)
31  format(' *** GEOG.----->LAMB ***')
                WRITE(2,45)
45  format('Rang No point Longitude Latitude XLambert YLambert ')
                else
                    if(ich.eq.3)then
                        write(2,32)
32  format(' *** LAMBERT ----->UTM ***')
                        write(*,*) ' Rang No point Xlambert Ylambert '
                        WRITE(2,49)
49  format('Rang No point Xlambert(VLU) Ylambert(VLU)
* Longitude Latitude No fuseau XUTM YUTM ')
                        else
                            if(ich.eq.4)then
                                write(2,33)
```

```

33     format(' *** UTM----->LAMB  ***')
      write(2,47)
47     format(' Rang No point  XUTM  YUTM  V  No fuseau  Longitude
*Latitude  XLambert  YLambert')
      else
      if(ich.eq.5)then
      write(2,34)
34     format(' *** GEOG ----->UTM  ***')
      WRITE(2,51)
51     format('Rang No point  Longitude  Latitude
* No fuseau  XUTM  YUTM  ')
      else
      if(ich.eq.6)then
      write(2,35)
35     format(' *** UTM----->GEOG  ***')
      WRITE(2,50)
50     format('Rang No point  XUTM  YUTM  V
* No fuseau  Longitude  Latitude  ')
      else
      endif
      endif
      endif
      endif
      endif
      endif
      endif
      PI=31415926535898D-13
      I=0
25     I=I+1
      IF(ICH.EQ.4.OR.ICH.EQ.6)GOTO 901
      if(ich.eq.2.or.ich.eq.5) then
      write (*,36)
36     format ( ' Rang No point      Longitude  Latitude Gr ')
      else
      endif
      READ(*,*)k,Np,X,Y
      GOTO 902
901     write(*,39)
39     format(' Rang No point  X UTM  Y UTM  V  No fuseau ' )
      READ(*,*)K,NP,X,Y,V,NF
902     IF(k.EQ.0.AND.np.EQ.0)GOTO 40
      IF(ICH.EQ.1.or.ich.eq.3)GOTO 610
      IF(ICH.EQ.2)GOTO 620
      IF(ICH.EQ.4.OR.ICH.EQ.6)GOTO 640
      IF(ICH.EQ.5)GOTO 650
610     CALL LGEO(X,Y,ALAM,PHI)
      ALAM1=ALAM*200./PI
      PHI1=PHI*200./PI
      IF(ICH.EQ.3)GOTO 670

```

```

WRITE(2,101)K,NP,X,Y,ALAM1,PHI1
  WRITE(*,101)K,NP,X,Y,ALAM1,PHI1
101  FORMAT(2X,2(I5,1X),2(F13.3,2X),2(F15.8,2X))
    GOTO 25
670  Alam2=ALAM*180./PI
    IF(ALAM2.LT.0.0)GOTO 365
    IF(ALAM2.GE.6)GOTO 364
    NF=31
    GOTO 370
364  NF=32
    GOTO 370
365  IF(ALAM2.LE.-3)GOTO 367
    NF=30
    GOTO 370
367  NF=29
370  CALL GUTM(ALAM,PHI,NF,XUTM,YUTM)
    IF(ICH.EQ.5)GOTO 680
    WRITE(2,100)NP,X,Y,ALAM1,PHI1,NF,XUTM,YUTM
      WRITE(*,100)NP,X,Y,ALAM1,PHI1,NF,XUTM,YUTM
100  FORMAT(/,2X,I5,2(F13.3,2X),2(F15.8,2X),/,2X,I5,2(F13.3,2X))
    GOTO 25
650  ALAM=X*PI/200
    PHI=Y*PI/200
    GOTO 670
      write(2,44)
44  format(' Rang No point Longitude Latitude  XUTM  YUTM')
680  WRITE(2,102)K,NP,X,Y,NF,XUTM,YUTM
    WRITE(*,102)K,NP,X,Y,NF,XUTM,YUTM
102  FORMAT(2(I5,2X),2(F15.8,2X),I5,2(F13.3,2X))
    GOTO 25
640  CALL UTMGEO(X,Y,NF,PHI,AMU)
    PHI1=PHI*200/PI
    AMU1=AMU*200/PI
    IF(ICH.NE.6)GOTO 936

WRITE(2,205)K,NP,X,Y,V,NF,AMU1,PHI1
  WRITE(*,205)K,NP,X,Y,V,NF,AMU1,PHI1
205  FORMAT(2(I5,1X),2(F13.3,2X),F13.6,I5,2(F15.8,2X))
    GOTO 25
936  CALL GEOL(AMU,PHI,XP,YP)
    IF(ICH.EQ.2)GOTO 939

WRITE(2,207)K,NP,X,Y,V,NF,AMU1,PHI1,XP,YP
  WRITE(*,207)K,NP,X,Y,V,NF,AMU1,PHI1,XP,YP
207  FORMAT(2X,2(I5,1X),2(F13.3,2X),F13.6,I5,2(F15.8,2X),/,2X,
* 2(F13.3,2X))
    GOTO 25
620  AMU=X*PI/200
    PHI=Y*PI/200

```

```

      GOTO 936
939  WRITE(2,208)K,NP,X,Y,XP,YP
      WRITE(*,208)K,NP,X,Y,XP,YP
208  FORMAT(2X,2(I5,2X),2(F15.8,2X),2(F13.3,2X))
      GOTO 25
40   CLOSE (2)
      STOP
      END

```

```

SUBROUTINE LGEO(X,Y,ALAM,PHI)
IMPLICIT DOUBLE PRECISION (A-H,O-Z)
PI=31415926535898D-13
CX=5.D+05
CY=3.D+05
X1=X-135.D+0
Y1=Y-90.D+0
AK0=999625544D-09
ALAM0=(3.D+0*PI)/200.
PHI0=(4.D+01)*PI/2D+02
A=6378249145D-03
B=6356514870D-03
E2=((A*A)-(B*B))/(A*A)
E=DSQRT(E2)
V2=DSQRT(1.-E2*DSIN(PHI0)*DSIN(PHI0))
GN0=A/V2
R0=(AK0*GN0)/DTAN(PHI0)
X2=X1-CX
CR=(CY+R0)-Y1
GAM=DATAN(X2/CR)
R=(X2/DSIN(GAM))
A1=DTAN((PI/4)+(PHI0/2))
A2=(1.-E*DSIN(PHI0))/(1.+E*DSIN(PHI0))
AL0=DLOG(A1)+E/2*DLOG(A2)
F1=(1./DSIN(PHI0))*DLOG(R/R0)
AL=AL0-F1
PHI=2*(DATAN(EXP(AL))-PI/4)
362  CALL ISO(PHI,AL,PHIA)
      DEL=DABS(PHIA-PHI)
      IF(DEL.LE.1.5707963D-10)GOTO 363
      PHI=PHIA
      GOTO 362
363  PHI=PHIA
      ALAM=ALAM0+(GAM/DSIN(PHI0))
      RETURN
      END

```

```

SUBROUTINE ISO(PHI,AL,PHIA)
IMPLICIT DOUBLE PRECISION(A-H,O-Z)
PI=31415926535898D-13
EP2=6803511142155D-15
EP=DSQRT(EP2)
A1=(1.-EP*DSIN(PHI))/(1.+EP*DSIN(PHI))
A2=AL-EP/2*DLOG(A1)
A3=EXP(A2)
PHIA=(DATAN(A3)-PI/4)*2
RETURN
END

```

```

SUBROUTINE GUTM(ALAM,PHI,NF,XUTM,YUTM)
IMPLICIT DOUBLE PRECISION(A-H,O-Z)
C=64000577348875D-07
EP2=685011612499D-14
PI=31415926535898D-13
PI4=180./PI
ALAM0=(6*NF-183)
ALAM0=ALAM0/PI4
2  ALAM=(ALAM-ALAM0)
CO=DCOS(PHI)
TH=CO*DSIN(ALAM)
PSI=(DLOG((1.+TH)/(1.-TH)))/2.
PHIP=DATAN(DTAN(PHI)/DCOS(ALAM))
ETA=PHIP-PHI
COP=CO*PSI
V2=1.+EP2*CO*CO
GNOR=C/DSQRT(V2)
PT=(EP2*COP*COP)/2.
PX=GNOR*PSI*(1.+PT/3)
PY=GNOR*ETA*(1.+PT)
XUTM=5.D+05+(9996D-04*PX)
CALL MERID (PHI,S)
YUTM=(PY+S)*9996D-04
RETURN
END

```

```

SUBROUTINE MERID(PHI,S)
IMPLICIT DOUBLE PRECISION(A-H,O-Z)
CO=DCOS(PHI)
SI=DSIN(PHI)
V=SI*CO
U=CO*CO
W0=PHI
W2=W0+V

```



```

W4=(3*W2+2*V*U)/4
W6=(5*W4+2*V*U*U)/3
W8=(7*W6+4*V*U**3)/8
C=64000577348875D-07
AL=5.137587093576D-03
BE=4.399133524D-05
GA=1.7578502D-07
DE=1.354666D-09
S=C*(W0-AL*W2+BE*W4-GA*W6+DE*W8)
RETURN
END

```

```

SUBROUTINE UTMGEO(XPOINT,YPOINT,NFUS,PHI,AMU)
IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C=640005773489D-05
EP2=6850116125D-12
PI=31415926535898D-13
GN=YPOINT/9996D-04
PHI=GN/6366197724D-03
SI=DSIN(PHI)
CO=DCOS(PHI)
V2=1.+EP2*CO*CO
GNOR=C/DSQRT(V2)
CALL MERID(PHI,S)
PX=(XPOINT-5.D+05)/9996D-04
PX=PX/GNOR
PY=GN-S
ECX=EP2*CO*CO*PX*PX*0.5
PSI=PX*(1.-ECX/3)
ETA=PY/GNOR*(1.-ECX)
PHIP=PHI+ETA
AMU=DATAN(DSINH(PSI)/DCOS(PHIP))
GPHIP=DATAN(DCOS(AMU)*DTAN(PHIP))
VM2=V2-1.5*EP2*SI*CO*(GPHIP-PHI)
PHI=PHI+VM2*(GPHIP-PHI)
IF(NFUS.EQ.29)AMU=AMU-9.*PI/180
IF(NFUS.EQ.30)AMU=AMU-3.*PI/180
IF(NFUS.EQ.31)AMU=AMU+3.*PI/180
IF(NFUS.EQ.32)AMU=AMU+9.*PI/180
RETURN
END

```

```

SUBROUTINE GEOL(XLONG,XLAT,XL,YL)
IMPLICIT DOUBLE PRECISION (A-H,O-Z)
PI=31415926535898D-13
XLAMD0=3.*PI/200
XLAT1=XLAT*200/PI

```

```

IF(XLAT1.GT.38.5)GOTO 2000
PHI0=37.*PI/200
AK0=999625769D-09
AK0=999625769D-09
GOTO 2001
2000  PHI0=40.*PI/200
      AK0=999625544D-09
2001  A=637824914533D-05
      E2=6803511282D-12
      E=DSQRT(E2)
      EP2=6850116125D-12
      TAN1=DSIN(PI/4.+PHI0/2)/DCOS(PI/4+PHI0/2)
      TAN2=(1.+E*DSIN(PHI0))/(1.-E*DSIN(PHI0))
      XLO=DLOG(TAN1)-(E/2*DLOG(TAN2))
      TAN1=DSIN(PI/4+XLAT/2)/DCOS(PI/4+XLAT/2)
      TAN2=(1.+E*DSIN(XLAT))/(1.-E*DSIN(XLAT))
      XL=DLOG(TAN1)-(E/2*DLOG(TAN2))
      XNO=A/DSQRT(1.-E2*DSIN(PHI0)*DSIN(PHI0))
      TAN=DSIN(PHI0)/DCOS(PHI0)
      R0=AK0*XNO*(1./TAN)
      GAMA=(XLONG-XLAMDO)*DSIN(PHI0)
      R=R0*DEXP((XLO-XL)*DSIN(PHI0))
      XL=5.D+05+R*DSIN(GAMA)+135.
      YL=3.D+05+R0-R*DCOS(GAMA)+90.
      RETURN
      END

```

c programme assainissement :calcul du reseau des eaux pluviales
c (systeme unitaire ou separatif)

character aa*2

real l,ms,m,u,g,g1,leq,ieq

integer t,rep1,rep2,an,rep3,k1

dimension p1(50,12),z0(6,2),y(6,2),x(6),m(200),tc(6),u(2)

dimension a3(2),s1(2),s2(2),pr(2),pr1(2),ck(2),qbt(200),t(200)

dimension cr(200),p(200),s(200),qc(200),l(200),qmax(200),num(200)

dimension qadp(200),rq(100),rv(100),rh(100),v(100),h(100)

dimension v1(100),c(50),phi(100),pj1(2),vps(200),qps(100)

common t,cr,p,s,l,qbt,m,qc,ck

open (15,file='fres1',status='new')

open (20,file='fres2',status='new')

open (25,file='fres3',status='new')

open (30,file='fres4',status='new')

open (40,file='fdpluv',status='old')

open (45,file='fbv',status='old')

data tc/5,15,30,45,60,120/

u(1)=.8415

u(2)=1.2817

c introduction des donn,es pluviom,triques

write(*,1010)

1010 format(//////////,\$)

write(*,*)' CALCUL DU RESEAU ASSAINISSEMENT '

write(*,*)' DES EAUX PLUVIALES '

write(*,*)' '

write(*,*)' '

write(*,*)' SYSTEME UNITAIRE OU SEPARATIF '

WRITE(*,*)' '

write(*,*)' '

write(*,*)' '

write(*,*)' '

write(*,*)' '

write(*,*)' ***** MODELE DE A.CAQUOT *****'

write(*,*)' '

write(*,*)' '

write(*,*)' '

write(*,*)' '

write(*,*)' ELABORE PAR :'

write(*,*)' M.M.D.E ING- GEODESIEN '

write(*,*)' C.T.H '

pause

write(*,1010)

write(*,*)'ayant le tableau des pr,cipitations mensuelles tapez 1'

read(*,*)rep1

if(rep1.eq.1)then

write(*,*)'nombre d annees de l echantillon (DT+1) ? '

read(*,*)n

do 100 i=1,n

read(40,701)an,p1(i,1),p1(i,2),p1(i,3),p1(i,4),p1(i,5),p1(i,6),

```

    *p1(i,7),p1(i,8),p1(i,9),p1(i,10),p1(i,11),p1(i,12)
701 format(i4,12(x,f5.1))
100 continue
    do 102 i=1,n
        c(i)=0
        do 103 j=1,12
            c(i)=c(i)+p1(i,j)
103 continue
102 continue
    sl=0
    do 104 i=1,n
        sl=c(i)+sl
104 continue
    pa=sl/n
    r=0
    do 105 i=1,n
        r=r+(c(i)-pa)**2
105 continue
    e=(r/(n-1))**0.5
    cv=e/pa
    write(*,*)'la region du projet est: ? '
    write(*,*)' centre ou est de l algerie _____ -1'
    write(*,*)' ouest // // ----- 0'
    write(*,*)'centre du sahara // // ----- +1'
    write(*,*)'tapez le chiffre attribue, a votre site '
    read(*,*)rep2
    if(rep2+0)5,6,7
5  pj=0.0525*pa+18.6
    goto 10
6  pj=0.088*pa+9.2
    goto 10
7  pj=0.233*pa+6.1
10 b=(log(pj/600.)/log(48.))+1.
    write(15,11)pa
11 format('la pluviometrie moyenne annuelle en mm est :',f6.2)
    write(15,12)e
12 format('ecart type en mm est :',f7.2)
    write(15,16)cv
16 format('coefficient de variation est :',f4.2)
    write(15,21)pj
21 format('pluviometrie journaliere maximale en mm est:',f5.2)
    write(15,22)b
22 format('exposant climatique est : ',f4.2)
    write(15,23)
23 format('*****Pluviometrie - Cumulee*****')
    do 201 i=1,n
        write(15,24)i,c(i)
24 format('cummul(',i2,')',x,f7.1)
201 continue
    close(15)

```

```

else
write(*,*)'la pluviometrie journaliere max en mm ?'
read(*,*)pj
write(*,*)'coefficient de variation :cv ?'
read(*,*)cv
write(*,*)'exposant climatique : b ?'
read(*,*)b
endif
a1=((cv**2)+1)**0.5
g=(cv**2)+1
b1=(log(g))**0.5
c1=pj/a1
do 202 j=1,2
g1=u(j)*b1
pj1(j)=c1*exp(g1)
202 continue
do 203 i=1,6
do 204 j=1,2
z0(i,j)=pj1(j)*(tc(i)**(b-1))/(1440**b)
204 continue
203 continue
do 205 i=1,6
x(i)=log(tc(i))
do 206 j=1,2
y(i,j)=log(z0(i,j))
206 continue
205 continue
do 207 j=1,2
s1(j)=0.
s2(j)=0.
pr(j)=0.
pr1(j)=0.
do 208 i=1,6
s1(j)=s1(j)+x(i)
s2(j)=s2(j)+y(i,j)
pr(j)=pr(j)+(x(i)*y(i,j))
pr1(j)=pr1(j)+(x(i)**2)
208 continue
207 continue
z1=6.*pr(1)-s1(1)*s2(1)
z2=6.*pr1(1)-(s1(1)**2)
b3=z1/z2
d1=1./(1.+0.287*b3)
write(20,33)b3
33 format('***** b(T)=' ,2x,f5.3, '*****')
do 301 j=1,2
b5=(pr1(j)*s2(j)-pr(j)*s1(j))/(6.*pr1(j)-(s1(j)**2))
a3(j)=exp(b5)
write(20,34)j,a3(j)
34 format('***** a(T, ' ,i1,')=' ,2x,f5.3, '*****')

```

```

        ck(j)=(a3(j)*(0.5**b3)/6.6)**d1
301  continue
        d2=-0.41*b3
        d3=0.507*b3+0.95
        d4=d2*d1
        d5=d3*d1
        ms=6.25**d4
        write(*,*)'la formule de A.CAQUOT : '
        write(20,36)
36  format('**** formule de A.CAQUOT AJUSTEE ****')
        write(20,40)d4,d1,d5
        write(*,40)d4,d1,d5
40  format(2x,'k',2x,'l**',f5.3,x,'Cr**',f5.3,x,'S**',f5.3)
        write(20,41)ck(1)
        write(*,41)ck(1)
41  format(' pour T=5ans : k=',f6.3)
        write(20,42)ck(2)
        write(*,42)ck(2)
42  format(' pour T=10 ans : k=',f6.3)
c    bassins versants elementaires
        write(20,43)
43  format('**** Bassins versants elementaires ****')
        write(*,*)'nombre de bassins versants (B.V)? '
        read(*,*)nbv
        write(*,*)'si le type d habitation est homogene(Cr=cte)tapez 1'
        read(*,*)rep3
        if(rep3.eq.1)then
            write(*,*)'donnez le coefficient de ruissellement'
            read(*,*)cr1
        else
            endif
            do 303 i=1,nbv
                if(rep3.eq.1)then
                    read(45,702)num(i),p(i),s(i),l(i),t(i)
702  format(i4,2x,f5.2,2x,f6.4,2x,f7.4,2x,i2)
                    cr(i)=cr1
                else
                    read(45,703)num(i),cr(i),p(i),s(i),l(i),t(i)
703  format(i4,2x,f4.2,2x,f5.2,2x,f6.4,2x,f7.4,2x,i2)
                endif
303  continue
                write(20,50)
50  format('n=B.V cofr pentes surfce longur qbrte facor decor T ')
                do 304 i=1,nbv
                    call deb(i,t,cr,p,s,l,ck,d1,d4,d5,ms,qbt,m,qc)
                    write(6,51)num(i),cr(i),p(i),s(i),l(i),qbt(i),m(i),qc(i),t(i)
                    write(20,51)num(i),cr(i),p(i),s(i),l(i),qbt(i),m(i),qc(i),t(i)
51  format(i2,x,f4.2,3(x,f6.4),x,3(f5.3,x),i2)
304  continue
                write(20,52)

```

```

52 format('***** FIN F.RES2 *****')
    close(20)
c    groupement des bassins versants
    pause
    write(25,53)
53 format('*** Groupement des Bassins Versants ***')
    write(25,60)
60    format('ngpt bvcon seql creq leql ieqv qbte fcor qccor qmax qadp')
    write(*,*)'nombre de groupements ? '
    read(*,*)ng
    do 305 i=nbv+1,nbv+ng
    write(*,*)'groupement numero',i
    write(*,*)'donnez le numero du 1er B.V ? '
    read(*,*)j1
    write(*,*)'donnez le numero du 2eme B.V ? '
    read(*,*)j2
    write(*,*)'si le groupement est en SERIE tapez 1 '
    read(*,*)na
    if(na.eq.1)then
        iz=1
    aa='se'
    else
        iz=2
    aa='pa'
    endif
    call gpt(i,iz,j1,j2,cr,s,l,p,t,qc,teq,seq,peq,leq,ceq)
    s(i)=seq
    l(i)=leq
    p(i)=peq
    t(i)=teq
    cr(i)=ceq
    call deb(i,t,cr,p,s,l,ck,d1,d4,d5,ms,qbt,m,qc)
    qmax(i)=qc(j1)+qc(j2)
    qadp(i)=min(qmax(i),qc(i))
    write(25,70)i,j1,aa,j2,s(i),cr(i),l(i),p(i),qbt(i),m(i),qc(i),
    *qmax(i),qadp(i)
70    format(i3,x,i2,'-',a2,'-',i2,2x,f6.4,x,
    *f4.2,x,2(f6.4,x),5(f5.3,x))
305    continue
    write(25,71)
71    format('***** FIN F.RES3 *****')
    close(25)
    pause
c    verification    autocurage
    write(30,75)
75    format('**** Caracteristiques des Conditions Ecoulement ****')
    write(30,80)
80    format('nBV qadp pente dimt qps vps rq rv rh h0 v0 v1ps')
    write(*,*)'resultats : Q en m3/s ; V en m/s ;H en m '
    write(*,*)'nombre de collecteurs ?'

```

```

read(*,*)ncl
do 401 i=1,ncl
write(*,*)'numero du B.V ou du grpt correspondant au collecteur',i
read(*,*)jj
if(jj.le.nbv)then
qadp(jj)=qc(jj)
else
endif
write(*,*)'le debit      :',qadp(jj),'      m3/s'
write(*,*)'-----'
write(*,*)'la pente du collecteur est : ',p(jj),' m/m'
write(*,*)'le diametre phi en m ??? '
read(*,88)phi(i)
88 format(f5.3)
vps(i)=60.*((phi(i)/4.)**0.75)*(p(jj)**0.5)
qps(i)=vps(i)*3.1415927*(phi(i)**2)/4
rq(i)=qadp(jj)/qps(i)
write(*,90)rq(i)
90 format('RQ=',f4.2)
write(*,*)'donnez RH '
read(*,*)rh(i)
write(*,*)'donnez RV '
read(*,*)rv(i)
h(i)=rh(i)*phi(i)
v(i)=rv(i)*vps(i)
v1(i)=0.55*vps(i)
write(*,113)jj,qadp(jj),p(jj),phi(jj),qps(i),
*vps(i),rq(i),rv(i),rh(i),h(i),v(i),v1(i)
write(30,113)jj,qadp(jj),p(jj),phi(jj),qps(i),
*vps(i),rq(i),rv(i),rh(i),h(i),v(i),v1(i)
113 format(i3,x,f5.4,x,f6.4,3(x,f5.3),x,f4.2,x,2(f4.2,x),f5.3,
*x,2(f4.2,x))
401 continue
write(30,111)
111 format('***** FIN F.RES3 *****')
close(30)
write(*,*)'RESULTATS EN FICHIERS fres1 ...a fres4 '
stop
end
c sous programmes
subroutine gpt(i,iz,j1,j2,cr,s,l,p,t,qc,teq,seq,peq,leq,ceq)
real l,leq
integer t
dimension l(200),p(200),qc(200),cr(200),s(200),t(200)
if(iz.eq.1)then
x1=(l(j1)+l(j2))*sqrt(p(j1)*p(j2))
x2=(l(j1)*sqrt(p(j2)))+(l(j2)*sqrt(p(j1)))
peq=(x1/x2)**2
leq=l(j1)+l(j2)
else

```



```

    peq=((p(j1)*qc(j1))+(p(j2)*qc(j2)))/(qc(j1)+qc(j2))
    if(qc(j1).gt.qc(j2))then
        leq=l(j1)
    else
        leq=l(j2)
    endif
endif
seq=s(j1)+s(j2)
ceq=(cr(j1)*s(j1)+cr(j2)*s(j2))/seq
teq=max(t(j1),t(j2))
return
end
subroutine deb(i,t,cr,p,s,l,ck,d1,d4,d5,ms,qbt,m,qc)
    real m,ms,l
integer t
    dimension t(200),cr(200),p(200),s(200),l(200),qbt(200),m(200),
*qc(200),ck(2)
    w0=4.*s(i)
    w2=l(i)*l(i)
    w3=w0/w2
    m(i)=(w3**d4)
    if(t(i).eq.5)then
        j9=1
    else
        j9=2
    endif
    w11=(cr(i)**d1)*(p(i)**d4)*(s(i)**d5)
    qbt(i)=w11*ck(j9)
    if(m(i).gt.ms)then
m(i)=ms
    else
    endif
    qc(i)=qbt(i)*m(i)
return
end

```

```

c programme d'inversion d'une matrice
  double precision a(20,20),ainv(20,20),prod(20,20),b(20,20),p
  integer n,err,p1
  character*10 mtrix,intrix
  common a,b,n,err
  write(*,*)'DONNER NOM DE LA MATRICE : '
  read(*,76)mtrix
76 format(a10)
  write(*,*)'DONNER NOM DE LA MAT - INVERSE:'
  read(*,76)intrix
  open (unit=10,file=mtrix,access='direct',status='old',
  * form='formatted',recl=80)
  open (unit=88,file=intrix,status='new')
10 read(10,26,rec=1)n
26 format(i2)
  write(*,26)n
  do 21 i=1,n
  do 22 j=1,n
  p1=n*(i-1)+j+1
  read(10,23,rec=p1)a(i,j)
23 format(2x,d10.4)
  write(*,23)a(i,j)
  b(i,j)=a(i,j)
  pause
22 continue
21 continue
  close(10)
  call invers(a,ainv,n,err)
  if(err.eq.0) goto 60
50 write(*,*)'REDUIRE LA MATRICE '
  do 40 i=1,n
  write(*,23)(a(i,j),j=1,n)
40 continue
  goto 10
  write(*,*)' INVERSE ='
  do 70 i=1,n
  write(*,23)(ainv(i,j),j=1,n)
  write(88,23)(ainv(i,j),j=1,n)
  do 80 j=1,n
  p=0
  do 90 k=1,n
  p=p+b(i,k)*ainv(k,j)
90 continue
  prod(i,j)=p
80 continue
70 continue
  write(*,*)' PRODUIT A * A-1 ='
  do 100 i=1,n
  write(*,23)(prod(i,j),j=1,n)
100 continue

```

```

        goto 50
99 stop
60 end
c
c s/p d'inversion -----
    subroutine invers(a,b,n,err)
    double precision a(n,n),b(n,n),amax,ah,bh,s,abs
    do 10 i=1,n
    do 20 j=1,n
    if(i.eq.j) then
    b(i,j)=1.0
    else
    b(i,j)=0.
    endif
20 continue
10 continue
    err=0
    do 30 j=1,n-1
    amax=j
    do 40 k=j+1,n
    if(abs(a(k,j)).le.amax)goto 40
    amax=abs(a(k,j))
    jmax=k
40 continue
    if(j.eq.jmax) goto 50
    do 60 l=1,n
    ah=a(j,l)
    a(j,l)=a(jmax,l)
    a(jmax,l)=ah
    bh=b(j,l)
    b(jmax,l)=bh
60 continue
50 if(abs(a(j,j)).lt.1d-9) goto 110
    do 70 l=j+1,n
    s=a(l,j)/a(j,j)
    do 80 k=1,n
    a(l,k)=a(l,k)-s*a(j,k)
    b(l,k)=b(l,k)-s*b(j,k)
80 continue
70 continue
30 continue
    do 90 jj=1,n
    j=n+1-jj
    if(abs(a(j,j)).lt.1d-9)goto 110
    do 100 k=1,n
    do 105 l=j+1,n
    s=s+a(j,l)*b(l,k)
105 continue
    b(j,k)=(b(j,k)-s)/a(j,j)
100 continue

```

```
90 continue
    return
110 err=1
    return
end
```



```

read(*,*)n0(i,j)
102 continue
do 103 j=1,n(i)-1
write(*,*)'debit du troncon ',n0(i,j),' _',n0(i,j+1)
read(*,*)q(i,j)
write(*,*)'la longueur du troncon',n0(i,j),' _',n0(i,j+1)
read(*,*)l(i,j)
write(*,*)'le diametre du troncon',n0(i,j),' _',n0(i,j+1)
read(*,*)phi(i,j)
write(*,*)'la nature du troncon ',n0(i,j),' _',n0(i,j+1)
read(*,*)nat(i,j)
103 continue
write(*,*)'le debit du troncon ',n0(i,n(i)),'_',n0(i,1)
read(*,*)q(i,n(i))
write(*,*)'la longueur du troncon',n0(i,n(i)),'_',n0(i,1)
read(*,*)l(i,n(i))
write(*,*)'le diametre du troncon',n0(i,n(i)),'_',n0(i,1)
read(*,*)phi(i,n(i))
write(*,*)'la nature du troncon ',n0(i,n(i)),'_',n0(i,1)
read(*,*)nat(i,n(i))
101 continue
write(*,*)'veuillez taper 1 si les conduites ont la meme rugosite'
read(*,*)m1
if (m1.eq.1) then
write(*,*)'choix de canalisations du reseau ? '
call typ(a,k1,a1,a2,a3)
z1=a1
z2=a2
z3=a3
else
do 201 i=1,m
do 202 j=1,n(i)-1
write(*,*)'type de canalisation ',n0(i,j),'_',n0(i,j+1)
call typ(a,k1,a1,a2,a3)
a1=il(i,j)
a2=im(i,j)
a3=in(i,j)
202 continue
write(*,*)'type de canalisation',n0(i,n(i)),'_',n0(i,1)
call typ(a,k1,a1,a2,a3)
201 continue
endif
k=1
5 do 301 i=1,m
s1(i)=0
s2(i)=0
do 302 j=1,n(i)
if(m1.eq.1)then
pj(i,j)=z1*(l(i,j)/b)*(abs(q(i,j)/b)**z2)/((phi(i,j)/b)**z3)

```

```

pj1(i,j)=pj(i,j)*z2/abs(q(i,j)/b)
else
pj(i,j)=il(i,j)*(l(i,j)/b)*(abs(q(i,j)/b)**im(i,j))/
*((phi(i,j)/b)**in(i,j))
pj1(i,j)=pj(i,j)*im(i,j)/(abs(q(i,j)/b))
endif
if(q(i,j).le.0)then
pj(i,j)=-pj(i,j)
else
endif
s1(i)=s1(i)+pj(i,j)
s2(i)=s2(i)+pj1(i,j)
302 continue
dq(i)=(-s1(i)/s2(i))*b
301 continue
do 303 i=1,m
do 304 j=1,n(i)
if(nat(i,j).ne.i)then
dq0(i,j)=dq(i)-dq(nat(i,j))
q0(i,j)=q(i,j)+dq0(i,j)
else
dq0(i,j)=dq(i)
q0(i,j)=q(i,j)+dq(i)
endif
304 continue
303 continue
c      edition des resultats
40  format(106('-'))
write(6,8)k
write(10,8)k
8  format('itteration numero=',i2)
write(6,40)
write(10,40)
write(6,11)
write(10,11)
11  format('!', 'maille', '!', 'neoud', x, '!', 2x, 'tronc_', 2x, '!', 2x,
* 'phi', 3x, '!', 3x, 'long', 2x, '!', 3x, 'q0', 3x, '!', 4x, 'j', 4x, '!',
* 4x, 'j1', 5x, '!', 2x, 'c.m', x, '!', x, '-cma', x, '!', 'ctotal', '!',
* 'debitcor', '!')
write(6,40)
write(10,40)
do 401 i=1,m
do 402 j=1,n(i)-1
write(6,12)i,n0(i,j),n0(i,j),n0(i,j+1),phi(i,j),l(i,j),
*q(i,j),pj(i,j),pj1(i,j),dq(i),dq(nat(i,j)),dq0(i,j),
*q0(i,j)
write(10,12)i,n0(i,j),n0(i,j),n0(i,j+1),phi(i,j),l(i,j),
*q(i,j),pj(i,j),pj1(i,j),dq(i),dq(nat(i,j)),dq0(i,j),
*q0(i,j)

```

```

12  format('!',2x,i2,2x,'!',2x,i2,2x,'!',2x,i2,'_',i2,3x,'!',
* 2x,i4,2x,'!'
*,x,f7.2,x,'!',x,f6.2,x,'!',x,f7.4,x,'!',x,f9.4,x,'!',x,f4.2,
* x,'!',x,
* f4.2,x,'!',x,f4.2,x,'!',x,f6.2,x,'!')
write(6,40)
write(10,40)
402  continue
write(6,12)i,n0(i,n(i)),n0(i,n(i)),n0(i,1),phi(i,n(i)),
*i(i,n(i)),
*q(i,n(i)),pj(i,n(i)),pj1(i,n(i)),dq(i),dq(nat(i,n(i))),
*dq0(i,n(i)),q0(i,n(i))
write(10,12)i,n0(i,n(i)),n0(i,n(i)),n0(i,1),phi(i,n(i)),
*i(i,n(i)),
*q(i,n(i)),pj(i,n(i)),pj1(i,n(i)),dq(i),dq(nat(i,n(i))),
*dq0(i,n(i)),q0(i,n(i))
write(6,40)
write(10,40)
write(6,13)s1(i),s2(i),dq(i),s1(i),s2(i)
write(10,13)s1(i),s2(i),dq(i),s1(i),s2(i)
13  format('!','DQ=-',f7.4,'/',f9.4,'=',x,f4.2,x,'/s',
*23x,f7.4,3x,f9.4)
write(6,40)
write(10,40)
401  continue
it=1
9   if(abs(dq(it)).ge. 0.02)then
do 501 i=1,m
do 502 j=1,n(i)
q(i,j)=q0(i,j)
502  continue
501  continue
k=k+1
goto 5
write(6,40)
write(10,40)
else
it=it+1
if(it.le.m)then
goto 9
else
goto 7
endif
endif
close(10)
7    stop
end
subroutine typ(a,k1,a1,a2,a3)
dimension a(9,3)

```



```

integer k1
write(*,*)' on designe par k la RUGOSITE '
write(*,*)' '
write(*,*)'k=2 fonte non revetue acier non revetue eau moy- cor'
write(*,*)' beton grossier -----> 1'
write(*,*)' '
write(*,*)'k=1 fonte non revetue acier non revetue eau peu cor'
write(*,*)' -----> 2'
write(*,*)' '
write(*,*)'k= 0.5 fonte revetement ciment acier revetement ciment'
write(*,*)' beton type bonna-socomar'
write(*,*)' -----> 3'
write(*,*)' '
write(*,*)' k=0.25 fonte revetement bitume acier revetement bit '
write(*,*)'beton centrifuge -----> 4'
pause
write(*,*)' '
write(*,*)'k=0.10  acier lamine neuf acier lamine sonde neuf '
write(*,*)'beton lisse absest ciment '
write(*,*)' -----> 5'
write(*,*)' '
write(*,*)' k=0.05 fonte revet centrif acier revet centrifuge'
print*, 'beton precontraint type freninet '
write(*,*)' -----> 6'
write(*,*)' '
write(*,*)' k=0.025 amiante ciment non revetue '
write(*,*)' -----> 7'
write(*,*)' '
write(*,*)'k=0 50 D 200 amiante ciment revetue p.v.c '
write(*,*)' -----> 8'
write(*,*)' '
write(*,*)'k=0 250 D 1000 amiante ciment revetue p.v.c'
write(*,*)' -----> 9'
write(*,*)'donnez le numero attribue a votre type de canalisation'
read(*,77)k1
77 format(i2)
a1=a(k1,1)
a2=a(k1,2)
a3=a(k1,3)
return
end

```