```
          DOUBLE PRECISION Plat,plon,x,y,olat,olon,plad,plod,
     &    olad,olod,deg
C            --------------
C          original program from Gravity CD-ROM of Japan, ver.2(Komazawa,2004)
C            --------------
c        zone 55=14700.0; 54=14100.0; 53=13500.0; 52=12900.0; 51=12300.0
c
c        120E =< fdk < 126E k0=123
c        126E =< fdk < 132E k0=129
c        132E =< fdk < 138E k0=135
c        138E =< fdk < 144E k0=141
c        144E =< fdk < 150E k0=147
c        150E =< fdk < 156E k0=153
c
c
      1   continue
          write(6,601)
    601 format(1h ,'Lat.(ddmm.m*) Long.(ddmm.m*) Lat.(Org/ddmm.m*) Long.(O
     &rg/ddmm.m*)')
          read(5,*) plat,plon,olat,olon
          if( plat .eq. 9999. )   go   to   2
          plad = deg(plat)
          plod = deg(plon)
          olad = deg(olat)
          olod = deg(olon)
          call   XYCORD(PLAd,PLOd,Y,X,OLAd,OLOd)
          write(6,600) x,y,Plat,plon,olat,olon
          write(1,600) x,y,Plat,plon,olat,olon
    600 format(1h ,'X(m:easting) Y(m:northing) <-- Lat.(ddmm.mmmm) Long.(
     &ddmm.mmmm)',/25x,'origin : Lat.(ddmm.mmmm) Long.(ddmm.mmmm)',/
     &f12.1,1x,f12.1,1x,f11.4,1x,f12.4,1x,/
     &35x,f11.4,1x,f12.4/)
          go   to   1
      2 continue
cc    ********** Shut Window **********
        STOP
```

```
      END
C       ************************************
        DOUBLE PRECISION FUNCTION DEG(Pdm)
        DOUBLE PRECISION Pdm,p,pl
       pl = 1.0d0
       p = pdm
      if( pdm .lt. 0.d0 )   pl = - pl
      if( pdm .lt. 0.d0 )   p   = - p
      I = P/100.d0 + 0.0001d0
      DEG = DFLOAT(I) + ( P - 100.d0*DFLOAT(I) )/60.d0
      deg = pl * deg
      RETURN
      END
C       ****************************
        DOUBLE PRECISION FUNCTION DEMI(Pdeg)
        DOUBLE PRECISION Pdeg,p,Q,pl
       pl = 1.0d0
       p = pdeg
      if( pdeg .lt. 0.d0 )   pl = - pl
      if( pdeg .lt. 0.d0 )   p   = - p
      I = IFIX(SNGL( P * 1.00001d0 ))
      Q = ( P - DFLOAT(I) )*60.d0
      DEMI = 100.d0*DFLOAT(I) + Q
      demi = pl * demi
      RETURN
      END
C       ****************************************
        SUBROUTINE IKDO(XCOR,YCOR,PLAT,PLON,OLAT,OLON)
      DOUBLE PRECISION SE,PLAT,PLON,XCOR,YCOR,OLAT,OLON,
     &   XPI,YPK,X,Y,DX,DY,AX,AY
      SE = 0.1
C      SE = 20.
           PLAT = OLAT + 1.
           PLON = OLON + 1.
      CALL XYCORD(OLAT,OLON,X,Y,OLAT,OLON)
      CALL XYCORD(PLAT,PLON,XPI,YPK,OLAT,OLON)
```

```
              XPI = XPI - X
              YPK = YPK - Y
            PLAT = OLAT + (XCOR-X)/XPI
            PLON = OLON + (YCOR-Y)/YPK
    1 CALL XYCORD(PLAT,PLON,X,Y,OLAT,OLON)
            DX = XCOR - X
            DY = YCOR - Y
          AX = DABS(DX)
          AY = DABS(DY)
        IF( AX .LT. SE .AND. AY .LT. SE )  GO  TO  2
            PLAT = PLAT + DX/XPI
            PLON = PLON + DY/YPK
        GO  TO  1
    2 CONTINUE
        RETURN
        END
C           ********************************************
          SUBROUTINE XYCORD(PLAT,PLON,XCOR,YCOR,OLAT,OLON)
        DOUBLE PRECISION A,F,PAI,PLAT,PLON,XCOR,YCOR,OLAT,OLON,
       &  PID,OID,PKD,SN,CN,T,EE,ETA,X,Y,ES,BOYU,Z,XYFAC,YORG,
       &  ZA,ZB,ZC,ZD,ZE,ZF,FAC,E2,E4,E6,E8,E10,BSN,CSN,DSN,ESN,FSN
c     ------------------------
c       a:Semimajor Axis
c       f:Flattening
c       e:Squre root of Eccentricity, ep**2 = 2*fl - fl**2
c     ---------------------- -------------------
c     -------- Bessel(Tokyo datum) ---------
cc        A = 6377397.15500D0
cc        F = 1.0d0/299.1528128d0
c     ------------------------
c     -------- GRS80(WGS84) ---------
        A = 6378137.000D0
        F = 1.0d0/298.257223563d0
c     ------------------------
        PAI = 3.141592653523D0
        XYFAC = 0.9999D0
```

```
  YORG = 0.D0
  IF( OLAT .EQ. 0.D0 )  XYFAC = 0.9996D0
  IF( OLAT .EQ. 0.D0 )  YORG = 500000.D0
  PID = PLAT*PAI/180.D0
  OID = OLAT*PAI/180.D0
  PKD = (PLON-OLON)*PAI/180.D0
  SN = DSIN(PID)
  CN = DCOS(PID)
  T = SN/CN
  T = T*T
  EE = 2.0d0*F - F**2
  ETA = EE/(1.D0-EE)*CN**2
  ES = DSQRT(EE)*SN
  E2 = EE
  E4 = E2**2
  E6 = E2**3
  E8 = E2**4
  E10 = E2**5
  ZA = 1.D0 + 0.75D0*E2 + 45.D0*E4/64.D0 + 175.D0*E6/256.D0
 A + 11025.D0*E8/16384.D0 + 43659.D0*E10/65536.D0
  ZB = 0.75D0*E2 + 15.D0*E4/16.D0 + 525.D0*E6/512.D0
 B    + 2205.D0*E8/2048.D0 + 72765.D0*E10/65536.D0
  ZC = 15.D0*E4/64.D0 + 105.D0*E6/256.D0 + 2205.D0*E8/4096.D0
 C + 10395.D0*E10/16384.D0
  ZD = 35.D0*E6/512.D0 + 315.D0*E8/2048.D0
 D       + 31185.D0*E10/131072.D0
  ZE = 315.D0*E8/16384.D0 + 3465.D0*E10/65536.D0
  ZF = 693.D0*E10/131072.D0
  BSN = DSIN(2.D0*PID) - DSIN(2.D0*OID)
  CSN = DSIN(4.D0*PID) - DSIN(4.D0*OID)
  DSN = DSIN(6.D0*PID) - DSIN(6.D0*OID)
  ESN = DSIN(8.D0*PID) - DSIN(8.D0*OID)
  FSN = DSIN(10.D0*PID) - DSIN(10.D0*OID)
  FAC = ZA*(PID - OID) - 0.5D0*ZB*BSN + 0.25D0*ZC*CSN
 A - ZD*DSN/6.D0 + 0.125D0*ZE*ESN - 0.1D0*ZF*FSN
  Z = A * ( 1.D0 - EE ) * FAC
```

```
 BOYU = A/DSQRT(1.D0 - ES**2)
 X = 0.5D0 *PKD**2*CN*SN
A     +PKD**4*SN*CN**3*(5.D0 -T +9.D0*ETA + 4.D0*ETA**2) /24.D0
A     +PKD**6*SN*CN**5*(61.D0 -58.D0*T +T**2+270.D0*ETA
I       -330.D0*T      *ETA      )/720.D0
A     - PKD**8*SN*CN**7* ( -1385.D0 +3111.D0*T
A     - 543.D0*T**2 +T**3) /40320.D0
 Y=PKD*CN
A    +PKD**3*CN**3*( 1.D0 -T +ETA ) /6.D0
A    +PKD**5*CN**5*( 5.D0 -18.D0*T +T**2 +14.D0*ETA -58.D0*T*ETA)
I       /120.D0
A    -PKD**7*CN**7*(-61.D0 +479.D0*T -179.D0*T**2 +T**3)/5040.D0
 X = X*BOYU
 Y = Y*BOYU
 XCOR = XYFAC*(X + Z)
 YCOR = XYFAC*Y + YORG
 RETURN
 END
```