```
C     ******************************************************************
C     Direct PDF method Run
C     EXAMPLE 2: size design of two-bar trees
C     ******************************************************************
C     Performance function: g_1( x) = Sinus function with arbitrary distributions
C     Reliability index calculated using gauss-type quadrature formula. Strut Rectangular Opt0
C     29/11/2007 12:43
C
C
C
      N = 5
      YV = X(1)*X(1)*SQRT(X(2)*X(2))
      Y1 = 1.*X(1)*SQRT(X(2)*X(2))/(X(3)*X(3))/(X(4)*X(4))/(SQRT(X(5)*X(5))
      Y2 = 1. * X(1)*SQRT(X(2)*X(2))/(X(3)*X(3))/(X(4)*X(4))/(SQRT(X(5)*X(5))
C
C     X(1) -> GAUSSIAN DISTRIBUTION
C     X(2) -> GAUSSIAN DISTRIBUTION
C     X(3) -> BETA DISTRIBUTION
C     X(4) -> GAUSSIAN DISTRIBUTION
C     X(5) -> LOGNORMAL DISTRIBUTION
C
C
C
C ***********************************************************************
C     Copyright (c) 2010-2014 (Sachin Manz), All Rights Reserved.
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON X(20),XL(20),XU(20),X0(20),DX(20), GN(100), G1(20),
     *MR(8000),SMR(100),RPMR(20),IMR(20), XSIG(20),XK(20), X_STD(20),
     * X_MEAN(20), XSTD(20), XMEAN(20), XSTD0(20), XMEAN0(20),
     * CORR_ST_ZERO(20,20), ST(20), GN2_ZERO(20), G_ZERO(20),
     * ELARF(20), X_ZT(20,20),
     * ZERO_ST_ZERO(20,20), ZERO_ST(20), ZERO_GN2_ST_ZERO(20,20),
     * GN2_ZT_ZERO(20,20), ST1(20), GN2_ZERO(20), X_ZERO(20),
     * XK(2,2)
      REAL*8 XMU(20),SIG(20),RHO(20),ARG(20)
      COMMON /SRSI/ NMC,GN0, NMG, NSIG, NTQ, N
C
      COMMON /ARG/ X_Z, X_ST, X_ZT, X_ZR,X_ZC, X_ZRZ,X_ZCZ,
     1       X_ZRZ2, X_ZCZ
C
      OPEN(100,FILE='ITERATION_PROCESS.TXT')
      NCOR = 0
      X_ST = 0
      X_ZT = 0
      X_ZR = 0
      X_ZC = 0
      X_ZRZ = 0
      X_ZCZ = 0
      X_ZRZ2 = 0
      X_ZCZ2 = 0
      X_ZR = 0.0
      X_ZC = 0.0
      CONS_ST = 0.0
      CRZ_ST_ZZ = 0.0
      CRZ_ST_ZZ2 = 0.0
      ST = 0.0
      CRZ_XRC = 0.0
      CRZ_XCC = 0.0
      ELARF = 0.0
C
C     DEFINE NMAX, NRCMR.
      NMAX=400
      NRCMR=200
C     DEFINE NSIG AND TFNR.
      DO 10 I=1,20
        RPMR(I)=0.0
10    CONTINUE
C     * 1 : PRECISE GRIDSEMT BY USER     --- KOCHEN MER
      IPMR(1) = 0
      IPMR(2)=NSIG,NFC,NCOR.
C     SEQUENTIAL QUADRATIC PROGRAMMING METHOD.
      METHOD=2
C     DEFINE DESIGN VARIABLES.
      NDV=2
      N=NDV+1
C     DEFINE CONSTRAINT
      NCON=2
C     DEFINE NOORDER AND INITIAL DESIGN.
      NORDER=0
C     INITIAL VALUES.
      X(1)=1.0
      X(2)=SQRT(2)
      XL(1)=0
C     UPPER BOUNDS
      XU(1)=10.0
      XU(2)=10.0
      X(3)=0.5
      XU(3)=1.0
      X(4)=0.5
      XU(4)=1.0
      X(5)=0.5
      XU(5)=1.0
C
C     DEFINE IPRINT, NOMMAX, INFO.
      IPRINT=1
      IMOMP=1
      NOMOMAX
      INFO=0
C     INITIALIZE INFO TO ZERO.
      INFO=0
      ICONTR=0
      IITER=0
      IITER1=0
      IFEVAL=0
      IGFEVAL = 0
C
100   CALL SOP (NDV,NFUNCS,IPRINT,NDV,NCON,X,XL,XU,
     1 OBJ,NOMMAX,G1,NOMA,IFAM,NR,NMAX,IWP,IERR)
      IITER=IITER+1
C     ***********************************************************
C     PRINT *, ************************************************
C     PRINT *, * NUMBER OF OBJECTIVE FUNCTION CALLS *
C     PRINT *, ************************************************
C     PRINT *, * F(X)=X(1)                          *
C     PRINT *, ************************************************
C     PRINT *, * NUMBER OF GOOD NODE INTERATION ITER = ', ITER
C     PRINT *, * NUMBER OF OBJECTIVE FUNCTION CALLS FOR EVALUATION
C     1 IFEVAL = ', IFEVAL
C     PRINT *, * NUMBER OF OBJECTIVE FUNCTION CALLS FOR GRADIENT
C     1 IGFEVAL = ', IGFEVAL
C     PRINT *, * NUMBER OF CONSTRAINT FUNCTION CALLS FOR GRADIENT
C     1 IGFEVAL = ', IGFEVAL
C     PRINT *, * NUMBER OF FUNCTION F EVALUATION X_ZF = ', X_ZF
C     PRINT *, * NUMBER OF FUNCTION G_1 EVALUATION X_ZC = ', X_ZC
C     PRINT *, * EVALUATION FOR DERIVATIVE OF F X_ZRZ = ', X_ZRZ
C     PRINT *, * EVALUATION FOR DERIVATIVE OF G_1 X_ZCZ = ', X_ZCZ
C     PRINT *, * EVALUATION FOR DERIVATIVE OF F X_ZRZ2 = ', X_ZRZ2
C     PRINT *, * EVALUATION FOR DERIVATIVE OF G_1 X_ZCZ2 = ', X_ZCZ2
C     PRINT *, * ------------------ITERATION PROCESS-------------------
C     PRINT *, *  X(1)   X(2)      OBJ    GN2_G1     GN2_G2
C     1 CONS    CONS_G1    CONS_G2
C
      DO I = 1,ITER1
        I1 = I
        WRITE(100,*) X_ZT(I,1), X_ZT(I,2),GN2_ZT(I,1),GN2_ZT(I,2)
     1  ,CRZ_ST(I,1), CONS_ST(I,1), CONS_ST(I,2),CRZ_ST(I,2)
      WRITE(100,*)'X_ZT(I,1), X_ZT(I,2),GN2_ZT(I,1),GN2_ZT(I,2)
     1  ,CRZ_ST(I,1), CONS_ST(I,1), CONS_ST(I,2),
      ENDDO
C
C     ---------------------WRITE ITERATION PROCESS ----------------
      WRITE(100,*)'-------------------ENDDO ITERATION PROCESS-----------
      WRITE(100,*)'  X(1)      X(2)      OBJ     GN2_G1     GN2_G2
     1 CONS    CONS2
C
      DO I = 1,ITER1
        I1 = I
      WRITE(100,*) X_ZT(I,1), X_ZT(I,2),GN2_ZT(I,1),GN2_ZT(I,2)
     1  ,CRZ_ST(I,1), CONS_ST(I,1), CONS_ST(I,2),
      ENDDO
C
C     ---------------------WRITE ITERATION PROCESS ----------------
      WRITE(100,*)'-------------------ENDDO ITERATION PROCESS-----------
C
C     ---------------------WRITE OBJECTIVE FUNCTION ----------------
      WRITE(100,*)'  X(1)      X(2)      OBJ     GN2_G1     GN2_G2
     1 CONS    CONS2
C
      DO I = 1,ITER1
        I1 = I
      WRITE(100,*) X_ZT(I,1), X_ZT(I,2),GN2_ZT(I,1),GN2_ZT(I,2)
     1  ,CRZ_ST(I,1), CONS_ST(I,1), CONS_ST(I,2),
      ENDDO
C
C     ---------------------WRITE OBJECTIVE FUNCTION ----------------
C
C     ---------------------WRITE OBJECTIVE FUNCTION ----------------
      WRITE(100,*)'-------------------ENDDO OBJECTIVE FUNCTION ----
```