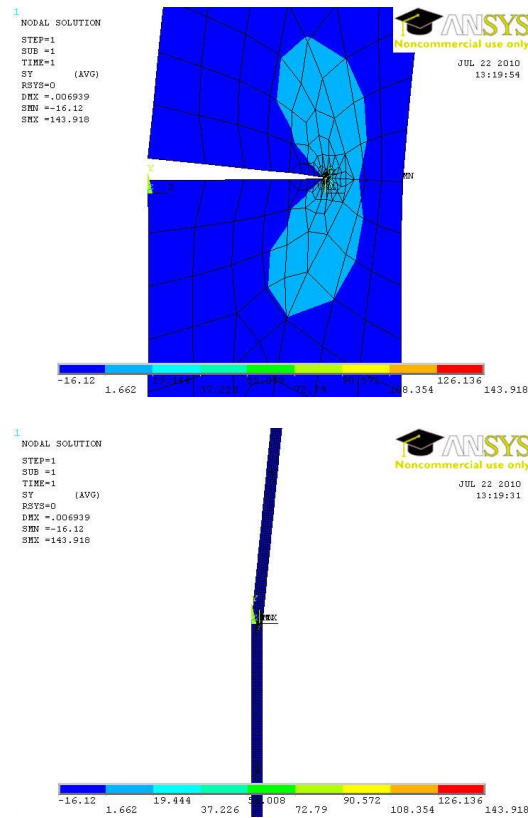


The macro of mixed-mode inclined central crack for values between $\beta=0^0-60^0$ of Circular Zone model

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!!! This macro is used to solve mixed mode inclined central crack problems in a

!!! semi-infinite strip under uniform tension loadings.

!!! The parameters/variables taken by the macro are:

!!! P : Uniform tension loading

!!! CR_L : Crack length

!!! WW : Plate width

!!! TETHA : Angle contraclockwise of crack

!!! BETHA : Angle clockwise of crack

!!! HH: 1/2 height of plate

!!! NEL_THET : Elements numbers at θ angle direction

!!! NEL_R : Elements numbers at radial direction

!!! CRFACE_LESIZE : Elements distribution ratio in the crack surface

!!! R_SIZE_RATIO : Distance ratio between elements at radial direction of crack

! zone

!!! R_F : Size of first circular element in the crack zone

!!! R_F1 : Size of three circular elements in the crack zone

!!! R_C : Size of crack zone at radial direction

GPI=acos(-1)

P=1

CR_L=1

```
TETHA=0
BETHA=TETHA/180*3.14159265358979324
WW=20
HH=40
NEL_THET=9
NEL_R=8
CRFACE_LESIZE=0.2
R_SIZE_RATIO=2
R_F=0.03
R_F1=R_F*3
R_C=R_F1+(NEL_R-3)*R_F* R_SIZE_RATIO
TO_1= CR_L/10E6
TO=CR_L-R_C+ TO_1
/PREP7
ET,1,PLANE82
MP,EX,1,30E3
MP,NUXY,1,0.3
K,1,-WW,HH
K,2,WW,HH
K,3, WW/COS(BETHA),,
K,4,-WW/COS(BETHA),,
CYL4, CR_L, , , , R_F1,180
CYL4,CR_L,,R_F1,,R_C,180
CYL4,- CR_L, , , , R_F1,180
CYL4,-CR_L,,R_F1,,R_C,180
NUMMRG,KP
CSYS,1
```

AGEN,ITIME,1,2,NINC,,TETHA,,KINC,1,1

AGEN,ITIME,3,4,NINC,,TETHA,,KINC,1,1

KMODIF,3,,TETHA

KMODIF,4,,180+TETHA

CSYS,0

LSTR,16,4

LSTR,4,1

LSTR,1,2

LSTR,2,3

LSTR,3,8

LSTR,9,15

AL,4,18,11,6,13,15,16,17

APLOT

ASEL,NONE

LSEL,NONE

KSEL,NONE

K,17,-WW/COS(BETHA),,

K,18,WW/COS(BETHA),,

K,19,WW,-HH

K,20,-WW,-HH

CYL4, CR_L, , ,180, R_F1,360

CYL4, CR_L, , R_F1 ,180, R_C,360

CYL4,- CR_L, , ,180, R_F1,360

CYL4, -CR_L, , R_F1 ,180, R_C,360

NUMMRG,KP

CSYS,1

AGEN,ITIME,8,9,NINC,,TETHA,,KINC,1,1

```
AGEN,ITIME,6,7,NINC,,TETHA,,KINC,1,1
KMODIF,17,,TETHA
KMODIF,18,,180+TETHA
CSYS,0
L,18,29
L,18,20
L,20,19
L,19,17
L,17,23
L,22,30
AL,24,29,31,33,34,35,36,22
APLOT
ALLSEL
CSYS,0
CLOCAL,11,0,1*COS(BETHA),1*SIN(BETHA),,TETHA
KSEL,,LOC,Y,TO_1,-TO_1
KSEL,U,LOC,X,-TO_1,-2*CR_L+TO_1
NUMMRG,KP
ALLSEL,,KP
APLOT
ESIZE,0.6
KSCON,14, R_F,1, NEL_THET,1
KSCON,7, R_F,1, NEL_THET,1
KWPAVE,7
WPRO,TETHA,,90.000000
FLST,2,4,5,ORDE,4
FITEM,2,1
```

FITEM,2,-2
FITEM,2,6
FITEM,2,-7
ASBW,P51X
KWPAVE,14
FLST,2,4,5,ORDE,4
FITEM,2,3
FITEM,2,-4
FITEM,2,8
FITEM,2,-9
ASBW,P51X
LESIZE,18, CRFACE_LESIZE
LESIZE,36, CRFACE_LESIZE
LESIZE,3,,,3
LESIZE,23,,,3
LESIZE,21,,,3
LESIZE,2,,,3
LESIZE,32,,,3
LESIZE,4,,,3
LESIZE,22,,,3
LESIZE,10,,,3
LESIZE,27,,,3
LESIZE,9,,,3
LESIZE,7,,, (NEL_R-3)
LESIZE,41,,, (NEL_R-3)
LESIZE,38,,, (NEL_R-3)
LESIZE,5,,, (NEL_R-3)

LESIZE,25,,, (NEL_R-3)

LESIZE,12,,, (NEL_R-3)

LESIZE,46,,, (NEL_R-3)

LESIZE,48,,, (NEL_R-3)

LESIZE,14,,, (NEL_R-3)

LESIZE,30,,, (NEL_R-3)

LESIZE,24,,,NEL_THET

LESIZE,28,,,NEL_THET

LESIZE,35,,,NEL_THET

LESIZE,20,,,NEL_THET

LESIZE,37,,,NEL_THET

LESIZE,39,,,NEL_THET

LESIZE,40,,,NEL_THET

LESIZE,42,,,NEL_THET

LESIZE,1,,,NEL_THET

LESIZE,19,,,NEL_THET

LESIZE,44,,,NEL_THET

LESIZE,43,,,NEL_THET

LESIZE,45,,,NEL_THET

LESIZE,49,,,NEL_THET

LESIZE,47,,,NEL_THET

LESIZE,50,,,NEL_THET

AMESH,11

AMESH,12

AMESH,13

AMESH,14

AMESH,1

AMESH,2
AMESH,6
AMESH,7
AMESH,5
AMESH,10
MSHKEY,1
AMESH,15
MSHKEY,1
AMESH,16
MSHKEY,1
AMESH,17
MSHKEY,1
AMESH,18
MSHKEY,1
AMESH,19
MSHKEY,1
AMESH,20
MSHKEY,1
AMESH,21
MSHKEY,1
AMESH,22
DK,20,UX,0
DK,20,UY,0
DK,19,UY,0
SFL,15,PRES,-P
SFL,33,PRES,-P
SAVE

```
/SOLU
SOLVE
/POST1
PLNSOL,S,Y
/EDGE,1,1
/REPL
CSYS,0
CLOCAL,11,1,1*COS(BETHA),1*SIN(BETHA),,TETHA
NSEL,,LOC,X,- CR_L/10E6, CR_L/10E6
*GET,NN1,NODE,0,NUM,MAX
NSEL,,LOC,Y,180+0.01,180-180/NEL_THET-0.01
NSEL,R,LOC,X,-0.001,R_F+R_F/100
NSEL,A,LOC,X,-0.001,0.001
ESLN,,1
NSEL,R,LOC,X,R_F/4-R_F/100,R_F/4+R_F/100
NSEL,R,LOC,Y,180+0.01,180-0.01
NSLE,R
*GET,NN2,NODE,0,NUM,MAX
NSEL,,LOC,Y,180+0.01,180-180/NEL_THET-0.01
NSEL,R,LOC,X,-0.001,R_F+R_F/100
NSEL,A,LOC,X,-0.001,0.001
ESLN,,1
NSEL,R,LOC,X,R_F-R_F/100,R_F+R_F/100
NSEL,R,LOC,Y,180+0.01,180-0.01
NSLE,R
*GET,NN3,NODE,0,NUM,MAX
NSEL,,LOC,Y,-180-0.01,-180+180/NEL_THET+0.01
```



```
NSEL,R,LOC,X,-0.001,R_F+R_F/100
NSEL,A,LOC,X,-0.001,0.001
ESLN,,1
NSEL,R,LOC,X,R_F/4-R_F/100,R_F/4+R_F/100
NSEL,R,LOC,Y,-180-0.01,-180+0.01
NSLE,R
*GET,NN4,NODE,0,NUM,MAX
NSEL,,LOC,Y,-180-0.01,-180+180/NEL_THET+0.01
NSEL,R,LOC,X,-0.001,R_F+R_F/100
NSEL,A,LOC,X,-0.001,0.001
ESLN,,1
NSEL,R,LOC,X,R_F-R_F/100,R_F+R_F/100
NSEL,R,LOC,Y,-180-0.01,-180+0.01
NSLE,R
*GET,NN5,NODE,0,NUM,MAX
/POST1
RSYS,11
ALLSEL
PATH,K1,5,,30,20
PPATH,1,NN1
PPATH,2,NN2
PPATH,3,NN3
PPATH,4,NN4
PPATH,5,NN5
CSYS,0
CLOCAL,11,0,1*COS(BETHA),1*SIN(BETHA),,TETHA
KCALC,1,1,3
```

!!! KCALC : Calculation of stress intensity factors (K1,K2)