

DAFTAR PUSTAKA

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LAMPIRAN

!# KG, METRE, SECOND, NEWTON, C

/PMACRO

/COM,Preferences for GUI filtering have been set to display:

/COM, Thermal

!*

*ASK,awal,1 to continue [Default],0

!##### PREPROCESSOR #####!

*IF,awal,EQ,1,THEN

/PREP7

!*

ET,1,solid70

ET,2,surf152

KEYOPT,2,4,1

KEYOPT,2,8,2

ET,3,targe170

ET,4,conta173

KEYOPT,4,1,1

KEYOPT,4,4,3

R,1

R,2

R,3

RMODIF,3,14,20E6

RMODIF,3,35,580

MPTEMP,1,0

MPDATA,DENS,1,,2710

MPTEMP,1,0,50,100,150,200,250,300

MPDATA,KXX,1,,175,177,179,180,182,184,185

MPDATA,C,1,,870,880,890,900,910,920,930

panjang=150/1000

lebar=70/1000

tebal=10/1000

xndiv=150/3

BLOCK,150/1000,,0/1000,-10/1000,-80/1000,,

BLOCK,150/1000,,,60/1000,0/1000,-10/1000,

/PNUM,AREA,1

/PNUM,VOLU,1

ASEL,ALL

AATT, 1, 2, 2, 0,

FLST,5,4,4,ORDE,4

FITEM,5,13

FITEM,5,15

FITEM,5,18

FITEM,5,20

CM,_Y,LINE

```

LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,70, , , ,1
!*
FLST,5,4,4,ORDE,4
FITEM,5,14
FITEM,5,16
FITEM,5,-17
FITEM,5,19
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,150, , , ,1
!*
FLST,5,4,4,ORDE,2
FITEM,5,21
FITEM,5,-24
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,10, , , ,1
!*

```

```

FLST,5,4,4,ORDE,2
FITEM,5,9
FITEM,5,-12
CM,_Y,LINE
LSEL,,,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1,,,70,,,,1
!*
FLST,5,4,4,ORDE,4
FITEM,5,2
FITEM,5,4
FITEM,5,-5
FITEM,5,7
CM,_Y,LINE
LSEL,,,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1,,,150,,,,1
!*
FLST,5,4,4,ORDE,4
FITEM,5,1
FITEM,5,3
FITEM,5,6
FITEM,5,8
CM,_Y,LINE

```

LSEL, , , P51X

CM,_Y1,LINE

CMSEL,,_Y

!*

LESIZE,_Y1, , ,10, , , ,1

!*

ALLSEL,ALL

VSWEEP,ALL

NSEL,ALL

ESEL,ALL

TYPE,2

MAT,1

REAL,1

ESURF

NSEL,S,LOC,Z,-10/1000

NSEL,R,LOC,Y,-10/1000,6/1000

ESEL,ALL

TYPE,3

MAT,1

REAL,2

ESURF

ASEL,S,,,1

NSLA,S,1

TYPE,3

MAT,1
REAL,3
TSHAP,QUAD
ESURF

ASEL,S,,,8
NSLA,S,1
TYPE,4
MAT,1
REAL,3
TSHAP,QUAD
ESURF

NSEL,S,LOC,Z,-10/1000
NSEL,U,LOC,Y,0/1000,-10/1000
ESLN,S,0,ALL
ESEL,A,TYPE,,2
CM,bottom,ELEM
ALLSEL,ALL

/ANG,1,-45,XS,1
/REP,FAST

EPLOT

!##### SOLUTION #####!

*ASK,hasil,1 for Solution [Default],0

*IF,hasil,EQ,1,THEN

/SOLU

ANTYPE,TRANS

TRNOPT,FULL

LUMPM,OFF

*ASK,shoulder,Shoulder Radius [Default],0.01

*ASK,pin,Pin Radius [Default],0.003

*ASK,tpin,Pin Height [Default],0.01

*ASK,rpm,RPM [Default],2100

*ASK,F,Force [Default],584

angka=0

pi=3.14

de=panjang/xndiv

miu=0.3

w=rpm*2*pi/60

asoul=(pi*shoulder**2)

apins=2*pi*pin*tpin

apint=pi*pin**2


```

tekanan=F/asoul
tcon=tekanan*miu
persen=0.95
panas1=(2/3)*pi*tcon*w*(shoulder**3-pin**3)*persen
panas2=2*pi*w*tcon*(pin**2)*tpin*persen
panas3=(2/3)*pi*w*tcon*(pin**3)*persen
ulang=(xndiv-(2*shoulder/de))+2

*ASK,fl,Heat [Default],panas1
*ASK,hpin,Heat [Default],panas2/apins
*ASK,bpin,Heat [Default],panas3/apint
*ASK,bulekb,Bulk Temperature (Bottom of Plate)[Default],25
*ASK,ambib,Ambient Temperature (Bottom of Plate) [Default],30
*ASK,buleke,Bulk Temperature (Top of Plate)[Default],25
*ASK,ambie,Ambient Temperature (Top of Plate) [Default],30

*ASK,velo,Velocity m/s [Default],0.00025
*ASK,ensubt,Nsubts [Default],0.05

TUNIF,25,

                                !# Convection
ASEL,S,LOC,Z,-tebal
SFA,ALL,1,CONV,ambib,bulekb
ASEL,ALL

ASEL,S,LOC,Y,lebar
ASEL,A,LOC,Y,-lebar
ASEL,A,LOC,X,

```

ASEL,A,LOC,X,panjang

ASEL,A,LOC,Z,-80/1000

SFA,ALL,1,CONV,ambie,buleke

ASEL,ALL

ESEL,S,TYPE,,2

SFE,ALL,1,CONV,1,30

SFE,ALL,1,CONV,2,25

ESEL,ALL

!# Moving Element Reference (Heat Source Reference) #!

*DO,i,1,ulang

xreferen=shoulder+((i-1)*de)

yreferen=0

!# Shoulder

ESEL,S,CENT,X,-shoulder+xreferen,shoulder+xreferen

ESEL,R,CENT,Y,-shoulder+yreferen,shoulder+yreferen

ESEL,R,CENT,Z,,-2/1000

ESEL,U,TYPE,,2

*GET,total,ELEM,,COUNT

!# Dimension of Heat #!

*DO,z,1,total

*GET,nomer,ELEM,,NUM,MIN

exelem=centrx(nomer)

xelem=exelem-xreferen

eyelem=centry(nomer)

yelem=eyelem-yreferen

kuadrat=xelem**2+yelem**2

!# Determine Heat Flux Value #!

chao=3*fl*sqrt(kuadrat)

qi=2*pi*shoulder**3

tang=chao/qi

!# Element Selection #!

*IF,kuadrat,LE,shoulder**2,AND,kuadrat,GE,pi**2,THEN

! If kuadrat() Less or Equal than Shoulder^2 then

*IF,eyelem,GT,0,THEN

SFE,nomer,6,HFLUX,,tang

! Apply Hflux to Selected Element with Chao Formula value

ESEL,U,ELEM,,nomer

! Unselect the Selected Element

*ELSE

```
SFE,nomer,3,HFLUX,,tang
! Apply Hflux to Selected Element with Chao Formula value
ESEL,U,ELEM,,nomer
*ENDIF

*ELSE

ESEL,U,ELEM,,nomer

*ENDIF

*ENDDO

!# Pin
ESEL,ALL
ESEL,S,CENT,X,-pin+xreferen,pin+xreferen
ESEL,R,CENT,Y,-pin+yreferen,pin+yreferen
ESEL,S,TYPE,,1
ESEL,R,CENT,Z,,-tpin

*GET,total,ELEM,,COUNT

*DO,p,1,total
    *GET,nomer,ELEM,,NUM,MIN
    exelem=centrx(nomer)
    xelem=exelem-xreferen
    eyelem=centry(nomer)
    yelem=eyelem-yreferen
    kuadrat=xelem**2+yelem**2
```

```
*IF,kuadrat,LE,pin**2,THEN
      SFE,nomer,4,HFLUX,,bpin
      ESEL,U,ELEM,,nomer
*ELSE
      ESEL,U,ELEM,,nomer
*ENDIF

*ENDDO

ESEL,ALL
ESEL,S,CENT,X,-pin+xreferen,pin+xreferen
ESEL,R,CENT,Y,-pin+yreferen,pin+yreferen
ESEL,S,TYPE,,1
ESEL,R,CENT,Z,,-tpin

*DO,t,1,total
      *GET,nomer,ELEM,,NUM,MIN
      exelem=centrx(nomer)
      xelem=exelem-xreferen
      eyelem=centry(nomer)
      yelem=eyelem-yreferen
      kuadrat=xelem**2+yelem**2

      *IF,kuadrat,LE,pin**2,THEN
            SFE,nomer,2,HFLUX,,hpin
            ESEL,U,ELEM,,nomer
      *ELSE
            ESEL,U,ELEM,,nomer
```

*ENDIF

*ENDDO

ESEL,ALL

angka=angka+1

*SET,dt,(de/velo)

TIME,angka*dt

AUTOTS,0

DELTIM,ensubt,0,0

KBC,1

OUTRES,ERASE

OUTRES,ALL,LAST

LSWRITE,angka

SFEDELE,ALL,2,HFLUX

SFEDELE,ALL,3,HFLUX

SFEDELE,ALL,4,HFLUX

SFEDELE,ALL,6,HFLUX

ESEL,ALL

*ENDDO

LSSOLVE,1,angka,1

ESEL,ALL

SAVE

/REPLOT

!##### POSTPROCESSOR#####!

*ASK,ani,1 for show animation [Default],0

*IF,ani,EQ,1,THEN

*ASK,feram,Number of frame [Default],30

*ASK,dile,Delay [Default],0.5

/POST1

PLNSOL,TEMP,,0

PLNS,TEMP,

ANTIME,feram,dile,,1,1,1,angka

*ELSE

FINISH

*ENDIF

*ELSE

FINISH

*ENDIF

*ELSE

FINISH

*ENDIF

FINISH