پروژه انتقال حرارت هدایت پیشرفته

(با نرم افزار flexPDE)

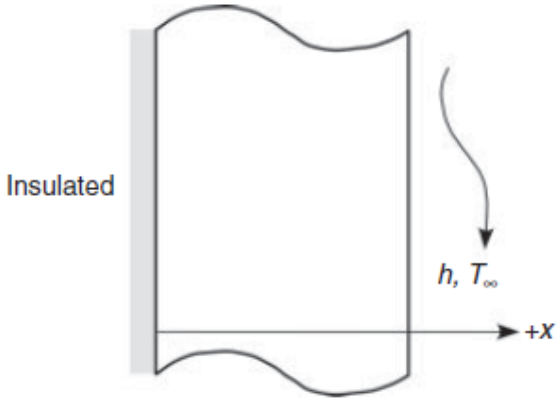


Figure 3-2 Transient heat conduction in a slab.

fluid of temperature T_∞, as depicted in Figure 3-2. There is no heat generation in the medium. The mathematical formulation of this problem is given as

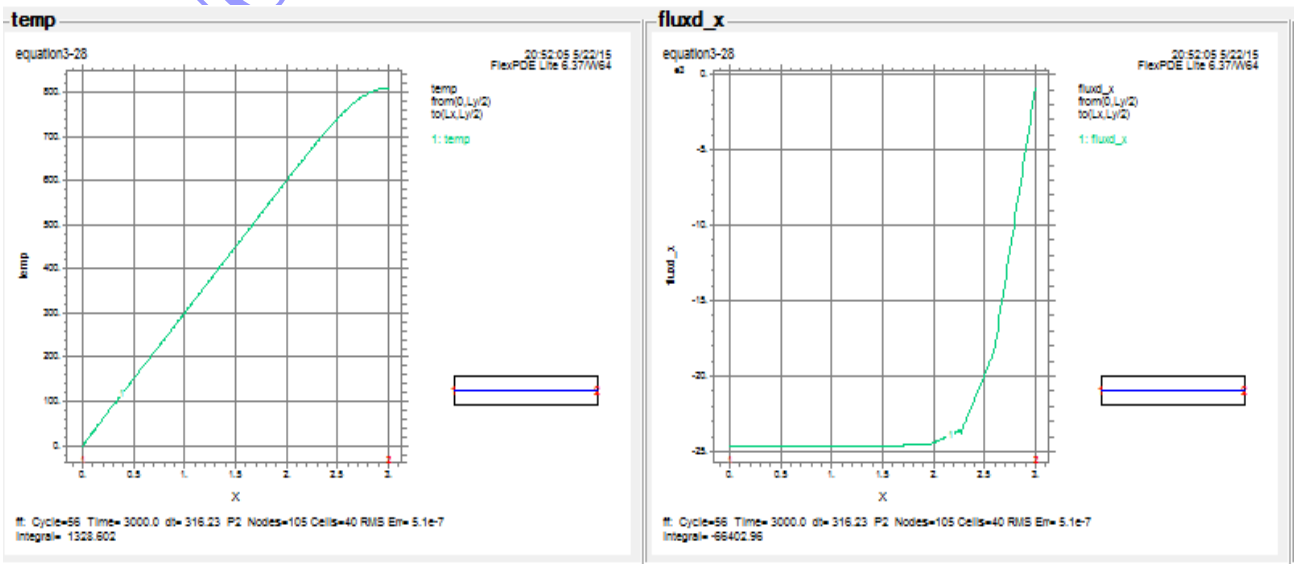
$$\frac{\partial^2 T(x,t)}{\partial x^2} = \frac{1}{\alpha}\frac{\partial T(x,t)}{\partial t} \qquad \text{in} \qquad 0 < x < L, \quad t > 0 \qquad (3\text{-}28)$$

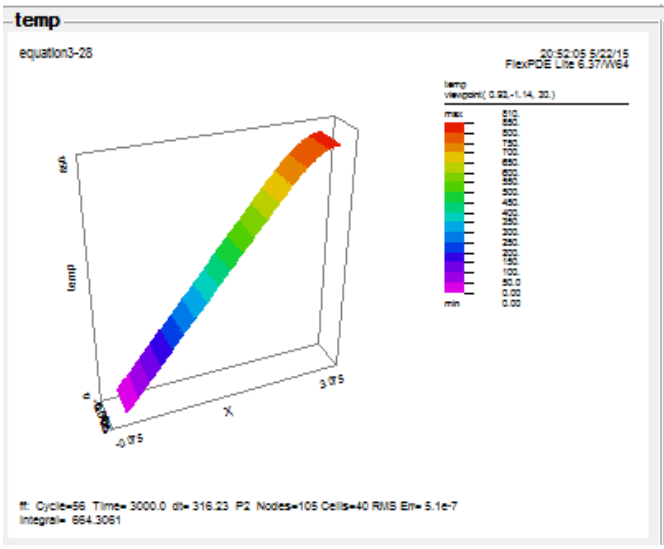
$$\text{BC1:} \quad \left.\frac{\partial T}{\partial x}\right|_{x=0} = 0 \qquad \text{BC2:} \quad -k\left.\frac{\partial T}{\partial x}\right|_{x=L} = h\left[T|_{x=L} - T_\infty\right] \qquad (3\text{-}29a)$$

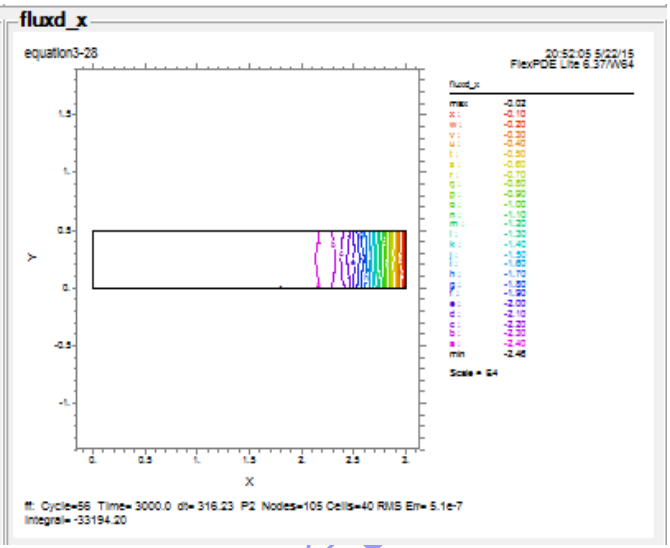
$$\text{IC:} \quad T(x, t=0) = F(x) \qquad (3\text{-}29b)$$

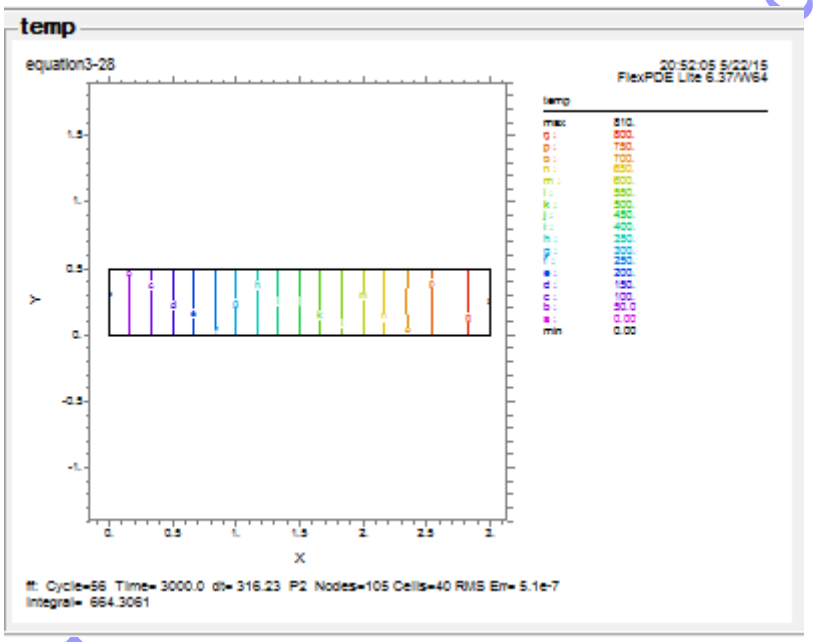

```
TITLE 'equation3-28'    { the problem identification}
COORDINATES cartesian2  { coordinate system, 1D,2D,3D, etc}
VARIABLES       { system variables}
 temp           { choose your own names}
SELECT          { method controls}
errlim=1e-3
DEFINITIONS     { parameter definitions}
Lx=3      Ly=0.5
k               rcp     {conductivity and heat capacity}
tempi=300       temp0=0     temp1=298.15
fluxd_x=-k*dx(temp)
INITIAL VALUES
```

```
temp=tempi*x
EQUATIONS       { PDE's, one for each variable}
  div(-k*grad(temp))+rcp*dt(temp)=0 { one possibility}

BOUNDARIES      { The domain definition}
  REGION 1     k=82       rcp=7.87e3*449  { For each material region}
    START(0,0)  natural(temp)=0  line to(Lx,0)    { Walk the domain boundary}
    natural(temp)=20*(temp1-tempi) line to(Lx,Ly) natural(temp)=0
line to (0,Ly) value(temp)=temp0 line to close

TIME 0 TO 10000    { if time dependent}

PLOTS           { save result displays}
for t=100,300,1000,3000,1000
elevation(temp)from(0,Ly/2)to(Lx,Ly/2)
elevation(fluxd_x)from(0,Ly/2)to(Lx,Ly/2)
contour(temp)
surface(temp)
contour(fluxd_x)
END
```









مثال ۲

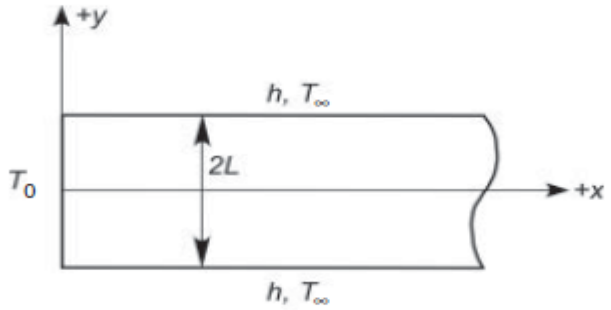


Figure 3-4 Problem description for Example 3-2.

The mathematical formulation of the problem is given as

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0 \qquad \text{in} \qquad 0 < x < \infty \quad 0 < y < L \tag{3-74}$$

$$\text{BC1:} \quad T(x=0) = T_0 \qquad \text{BC2:} \quad T(x \to \infty) = T_\infty \tag{3-75a}$$

$$\text{BC3:} \quad \left.\frac{\partial T}{\partial y}\right|_{y=0} = 0 \qquad \text{BC4:} \quad -k \left.\frac{\partial T}{\partial y}\right|_{y=L} = h\left[T|_{y=L} - T_\infty\right] \tag{3-75b}$$

TITLE 'equation3_74' { the problem identification}

COORDINATES cartesian2 { coordinate system, 1D,2D,3D, etc}

VARIABLES { system variables}

temp { choose your own names }

SELECT { method controls}

errlim=1e-3

DEFINITIONS

Lx=5 Ly= 0.4

heat= 0 temp1=298.15 temps=400 k=82

fluxd_x= -k*dx(temp) fluxd_y= -k*dy(temp)

fluxd= vector(fluxd_x, fluxd_y) fluxdm= magnitude(fluxd)

EQUATIONS

div(-k*grad(temp))- heat= 0