Advanced Finite Elements

ME EN 7540 Temperature Dependent Conductivity Spring 2006

This example is taken from ANSYS verification manual example vm93. The conductivity of an 85% magnesia insulating material is given by $k(T) = C_0 + C_1 T$ for 100°F $\leq T \leq$ 300°F. Determine the rate of heat flow q between these temperatures for a slab of thickness t.

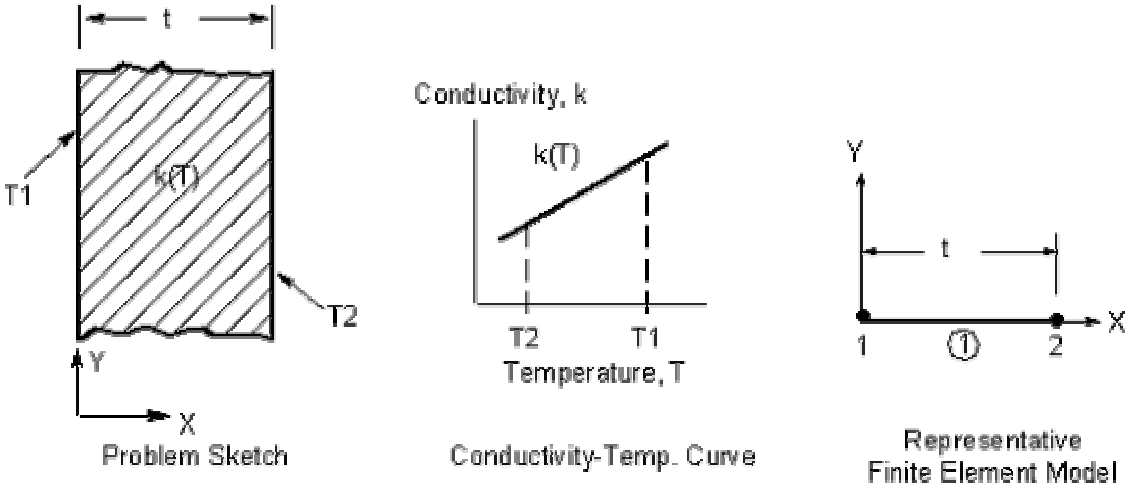

Figure 1 *Conductivity Problem Sketch*.

Material Properties	**Geometric Properties**	**Loading**
C_0 = 0.031 Btu/hr-ft-°F	t = 3 in = 0.25 ft	T_1 = 300°F
C_1 = 0.000031 Btu/hr-ft-°F^2		T_2 = 100°F

Analysis Assumptions and Modeling Notes

A 1 ft^2 area is used for the conduction element.

Results

Heat flow, q = 29.760 btu/hr.

Input Listing

```
/PREP7
/TITLE, TEMPERATURE DEPENDENT CONDUCTIVITY
ANTYPE,STATIC

!ELEMENT TYPE LINK32: CONDUCTION ELEMENT
ET,1,LINK32

!COEFFICIENTS OF TEMPERATURE-DEPENDENT CONDUCTIVITY C0 AND C1
MP,KXX,1,.031,31E-6

! AREA = 1
R,1,1

!CREATE NODES
N,1
N,2,.25

!CREATE ELEMENT
E,1,2

!OUTPUT OPTIONS
OUTPR,ALL,1
OUTPR,VENG,NONE

! STEP BOUNDARY CONDITIONS
KBC,1
D,1,TEMP,300
D,2,TEMP,100
FINISH

/SOLU
SOLVE
FINISH

/POST1
ETABLE,HEAT,SMISC,1
PRETAB,HEAT
FINI
```