Quiz 3

Lab 3a: Steady-State One-Dimensional Heat Transfer

1. When do you need to enter specific heat as a part of material properties in the heat transfer analyses?

   a) Steady-State conditions problem
   b) Transient conditions problem
   c) Always (both Steady-State and Transient conditions problem)
   d) two-dimensional problems

2. Which of these following material properties is always required in the heat transfer analyses?

   a) Thermal Conductivity
   b) Density
   c) Specific Heat
   d) Heat generation

3. A heat flow (which is in proportion to the product of conductivity and temperature gradient) is positive in the direction of _____?

   a) Decreasing Temperature
   b) Increasing Temperature
   c) Decreasing Temperature Gradient
   d) Increasing Temperature Gradient

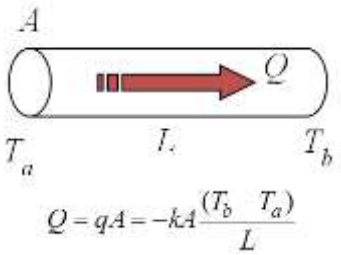

Figure LQ3–1 A rod with cross sectional area (A) and length of (L).

4. Which of these following **Element Types** is part of **Heat Transfer** family?

a) CPS4R
b) DC2D4
c) EC3D8R
d) C3D8I

5. If a material has thermal conductivity with a value of 10.0 [$W \cdot m^{-1} \cdot K^{-1}$], what will be its value when you use the following unit system: N, mm, tonne (10^3 kg), sec, °C.

   Recall: [K] = [°C] + 273.15

   a) 0.00365
   b) 0.00353
   c) 10
   d) 283.15

Lab 3b: Steady-State Composite Wall

Q3b –1 What is the value of heat flux? Compare the results derived from analytical solution v/s those from the simulation.

Q3b –2 Define a new path (a horizontal line connecting nodes as we go from the left to right edge of wall, similar to Lab 3a) and plot the temperature distribution along this path.

Lab 3c: Transient Two-Dimensional Heat Transfer with Convection

Q3c –1 Examine the temperature distribution in the plate by plotting contour plot of temperature?

Q3c –2 Plot the temperature history of the target node (NT1 vs. time) and briefly discuss about it

Tip: From the menu bar, select **Results→History Output** and select the nodal temperature for the target node.

Lab 3d: Steady-State Analysis with Uniform Internal Heat Generation

Q3d –1 Examine the temperature distribution in the plate and compare with analytical solution (Eq.7) by plotting analytical and Abaqus solutions in one graph.

Tip:

- Create a path plot of the temperature along the thickness
- Create XY data of temperate along the path and save the data.

- In the Results tree, find the saved data; click mouse button 3 on the data, and select Edit to access Abaqus solution. You can copy and paste these data in Excel sheet and plot it along with analytical solution obtained from Eq. 7