**CHAPTER-3**

**Case 2: One-dimensional steady-state conduction with heat generation**

Consider the plane wall in which there is uniform heat generation per unit volume

, the surfaces are maintained at Ts1 and Ts2 . For constant thermal conductivity, k, the appropriate form of the equation is

1-D conduction only in x-direction steady-state conduction with uniform heat

generation

………….

T(x) **=** ………. Temperature distribution

Hot fluid

, h1 Ts2 Uniform heat generation inside the plane wall (W/m3)

**qge**n

Ts1

Cold fluid

, h2

**X=-L x=0 x=L**

Boundary conditions

X=- L T=Ts1

X=+L T=Ts2

Substituting BCs will give :

Ts1 **=**

Ts2 **=**

Solving the equations simultaneously will give.

T(x) =

Heat flux =

As you see heat flux is dependent on x under conditions with heat generation

* If you have symmetrical BCs, according to the scheme below:

T0 (max. temperature)

**T0**

Ts Ts

x=-L x=0 x=+L

x=0 T=T0

x=L T=Ts

Temperature distribution will take the following form:

T(x) = (1)

Maximum temperature exists at the plane ……………. (2)

Taking the ratio of eqns (1) and (2) will give:

……………Temperature distribution for a system at:

* Steady-state
* Cartesian coordinates
* 1-D conduction (only x-direction)
* Uniform heat generation,
* Symmetrical BCs