**Governing Equation**

For, *one-dimensional, steady state, conductive* heat transfer,

**Parameters**

**Discretisation**

Dividing in to 5 equal control volumes, results in nodal distances, , of 0.1 m.

Now, over a control volume, for nodes 2,3 & 4, the governing equation:

So that,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

For or

Now, over a control volume, for node 1, equation 1 becomes:

So that,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Now, over a control volume, for node 5, equation 1 becomes:

So that,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Temperatures at nodes 1-5 can be evaluated by solving the following equations, where the coefficient matrix is formed from noting the respective coefficients in equations 2-4;

A similar procedure for 3, 10, 15 and 20 nodes is done and the solutions are plotted against the exact (analytical) solution, as well as the absolute percentage errors for each case.





The error is seen to decrease with the increase in the number of nodes and the numerical solution approaches the exact analytical solution.