INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

Report: Endsem Exam Coding Assignment (AE675A)

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Contents

Question 1:

A body force f(x) is on a rectangular plate (2x1) with four Dirichlet boundary edges, the material property is K_{11}, K_{12}, K_{21}, K_{22}.

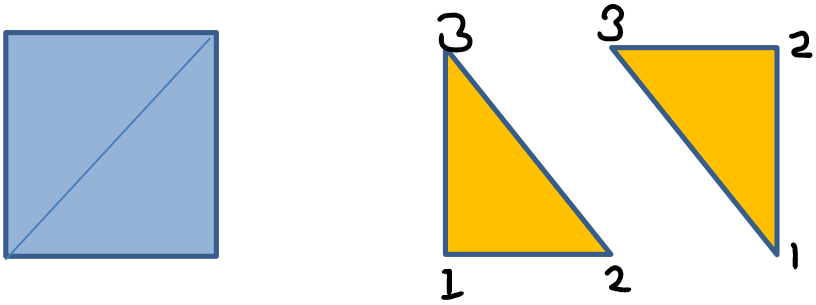
Problem description

a: length of domain=1
b: width of domain=2
f=10
Take N: number of elements on each side N=3
All edges have zero boundary condition (Dirichlet B.C.)
No Neumann's boundary condition present

Case 1: k11=k22=1 and k12=1 and K21=1
Case 2: k11=k22=1 and k12=0 and K21=0

1. **Element:**

The approximation is done using triangular element.

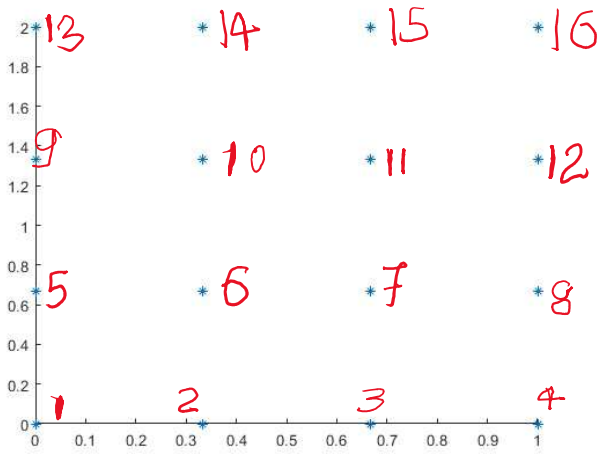


Here all the local node numbering is done in Counter clock wise sense.

2. **Mesh and Node creation:**

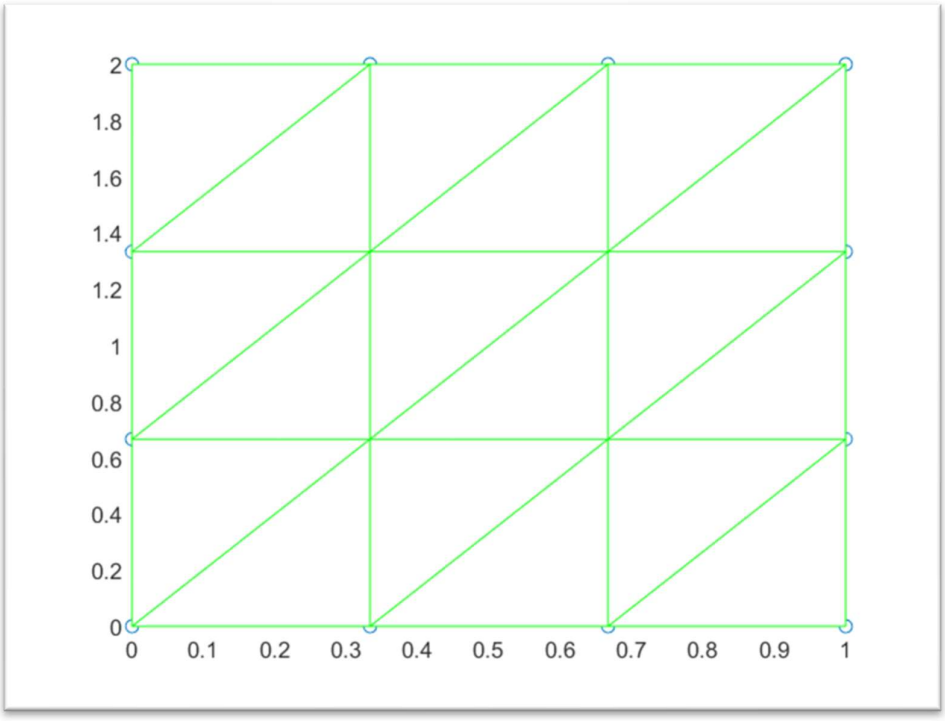
The mesh is created -

Total no of nodes =16



- The 1st element is taken to be the one which has the nodes 1,2,6 i.e. upright triangle as the 1st ,2nd and 3rd local node respectively and this numbering scheme is common for all upright triangle.
- The 2nd element is taken to be the one which has the nodes 1,6,5 i.e. downright triangle as the 1st ,2nd and 3rd local node respectively and this numbering scheme is common for all downright triangle.

Total no of elements = 18

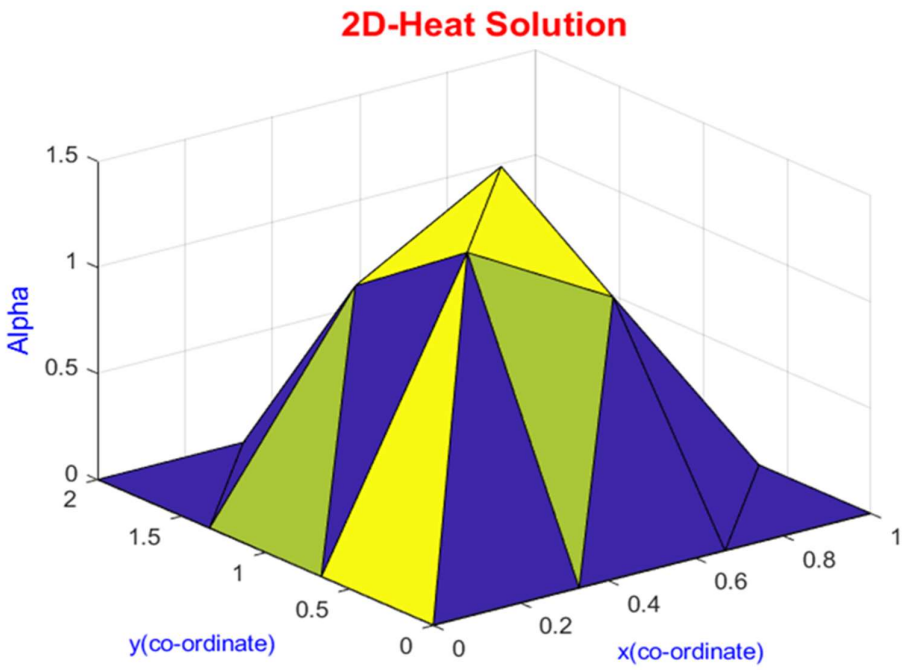


3. Plots and Results:

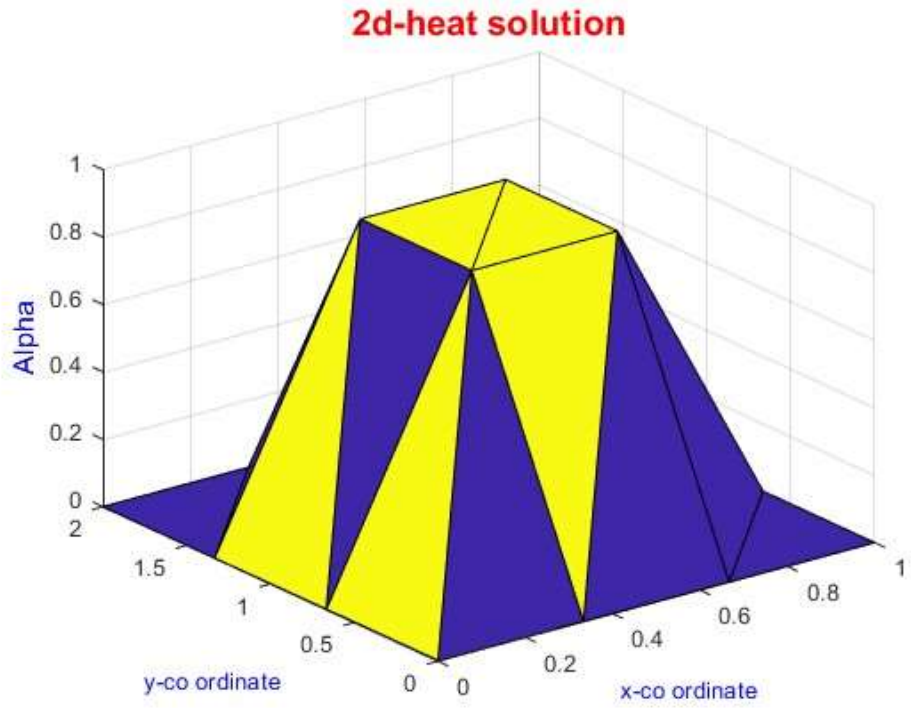
3.1 Case 1: k11=k22=1 and k12=1 and k21=1

No of elements:

- In this case 18 no of elements are used to approximate the result.



3.2 Case 2: k11=k22=1 and k12=0 and K21=0



4. Observation:

From Fig 1 and Fig 2 we can conclude that -

- The solution is zero at the boundary edges as it is given in the question statement.
- At the middle nodes the displacement/ temperature of plate is highest.