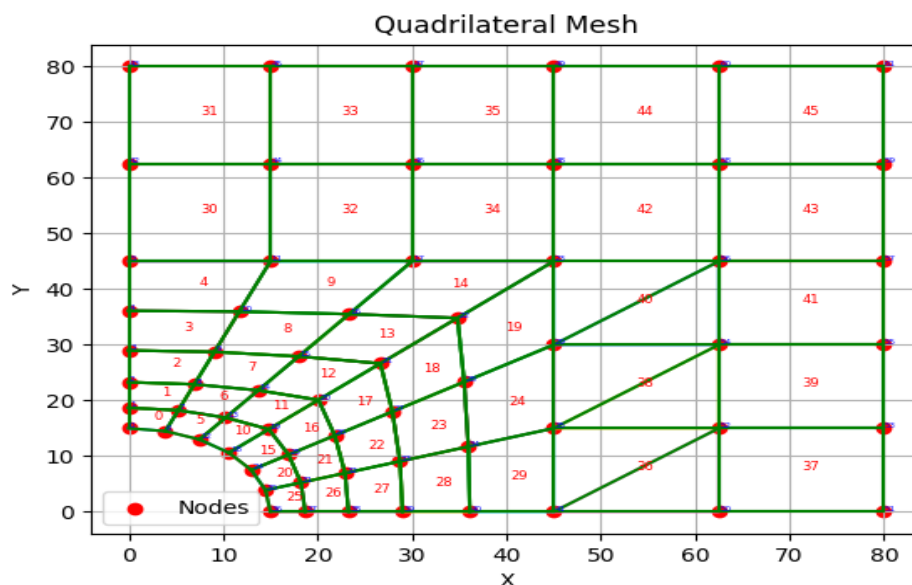


Tasks

1. The problem can be simplified as shown in the previous slides due to its symmetry. Material properties are as follows: $E = 200 \text{ GPa}$, $\nu = 0.3$. Consider $\frac{a}{r} \geq 5$.
 - (i) Chose a suitable title of the project, and write a report on this project covering following aspects.
 - (ii) Develop a finite element code to solve the problem in the given domain discretized with 4-node quadrilateral elements. Code must have the following capabilities— (a) It must be able to take dimensions a and r as input. (b) It must be able to discretize the domain with quadrilateral elements with four nodes. (c) Code must have flexibility to vary the number of elements in the domain.
 - (iii) Mesh Convergence: First perform the convergence analysis by mesh refinement. Identify the suitable number of elements must be taken for reasonable accuracy. Validate the code with respect to analytical solutions.
 - (iv) Investigation: Consider the converged mesh and perform a case study where you vary r while keeping $\frac{a}{r}$ constant (≥ 4). Report must contain plots for displacement, strain and stress fields suitably and discussions of results.

Title:- FEM Simulation of A plate with a hole

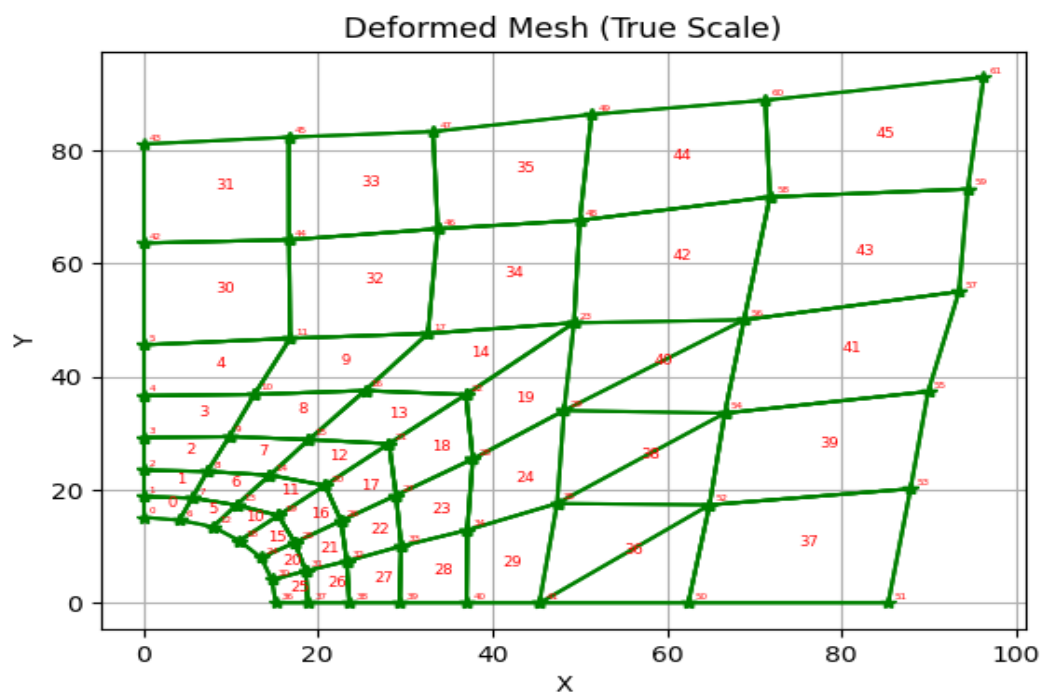
1. MESH PLOT



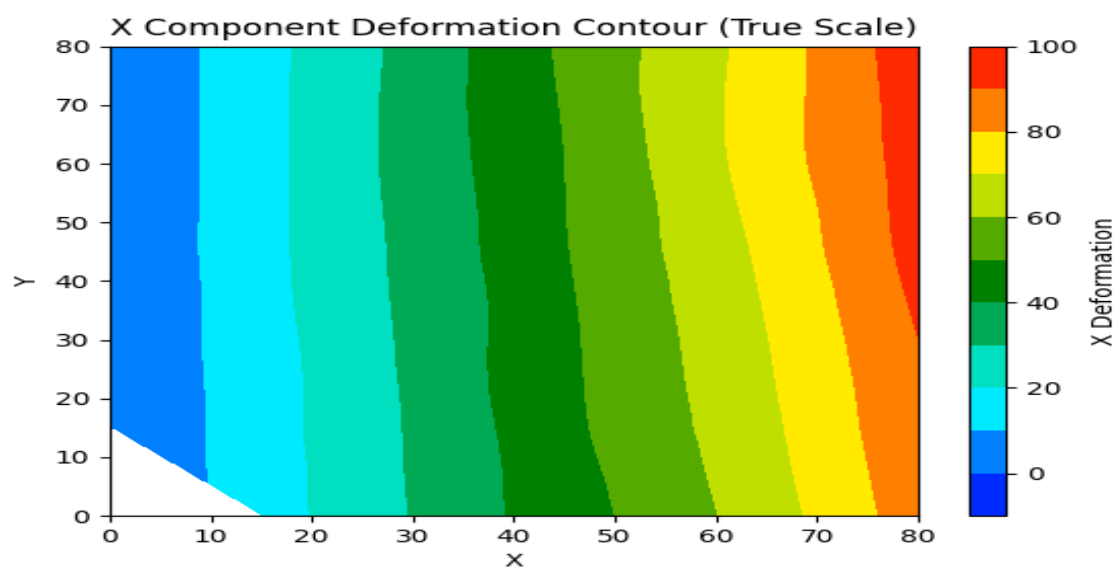
2. Reduced stiffness matrix will be

```
[>] Reduced stiffness matrix: [[ 8.841e+10  7.170e+09  0.000e+00 ...  0.000e+00  0.000e+00  0.000e+00]
[ 7.170e+09  2.042e+11  5.726e+09 ...  0.000e+00  0.000e+00  0.000e+00]
[ 0.000e+00  5.726e+09  2.077e+11 ...  0.000e+00  0.000e+00  0.000e+00]
...
[ 0.000e+00  0.000e+00  0.000e+00 ...  1.978e+11  3.571e+10 -3.571e+10]
[ 0.000e+00  0.000e+00  0.000e+00 ...  3.571e+10  9.890e+10 -4.945e+10]
[ 0.000e+00  0.000e+00  0.000e+00 ... -3.571e+10 -4.945e+10  9.890e+10]]
```

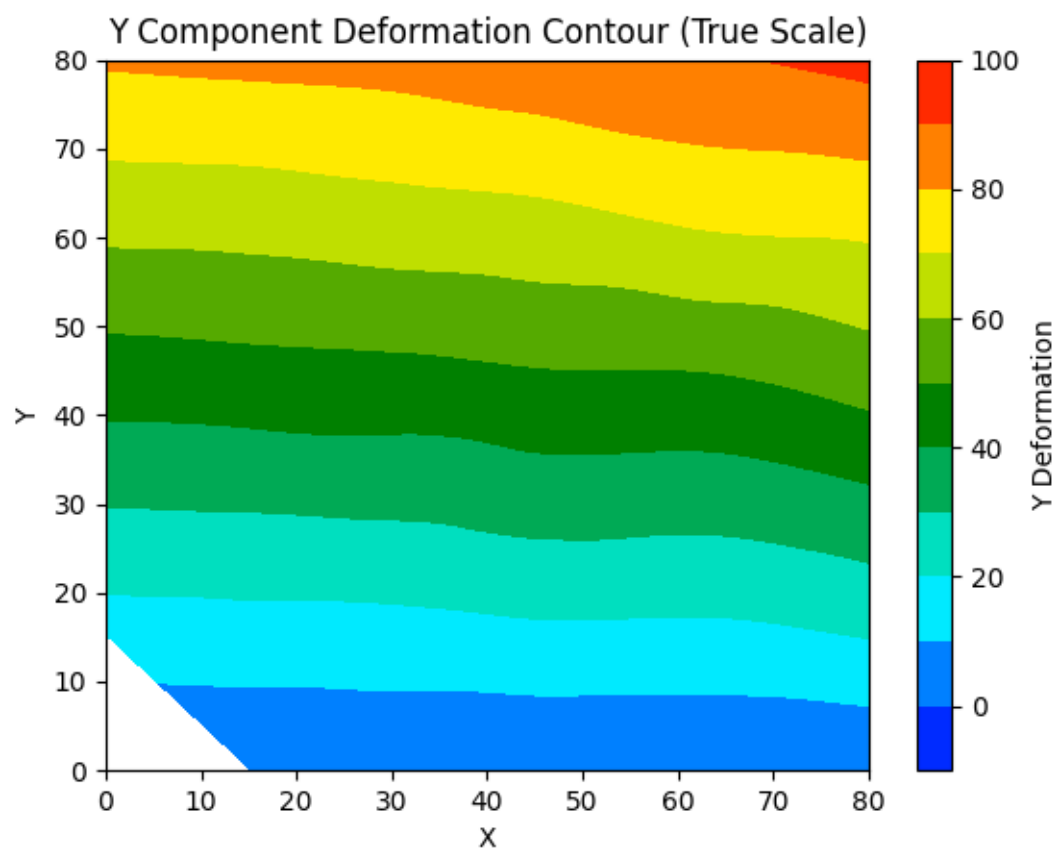
3. Defomed shape



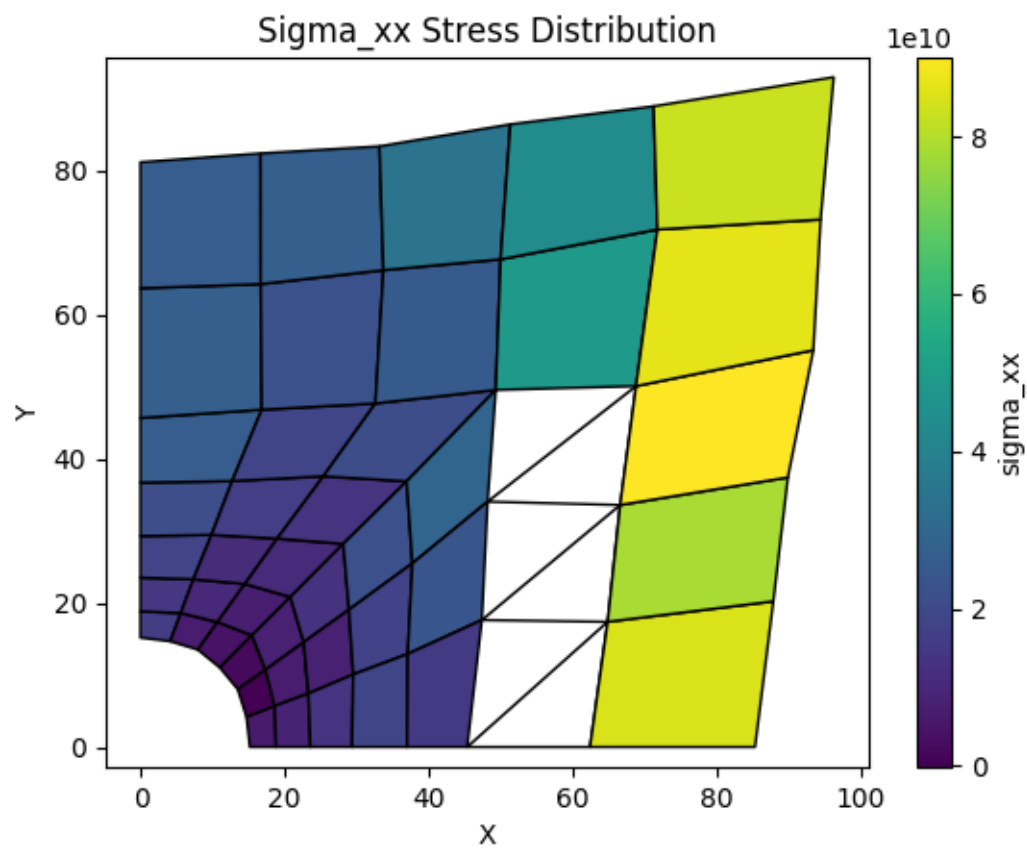
4. X – displacement



5. Y-Displacement



6. Stress Plot



7. Strain PLOT

