Program for 2D truss analysis (USING MATLAB)

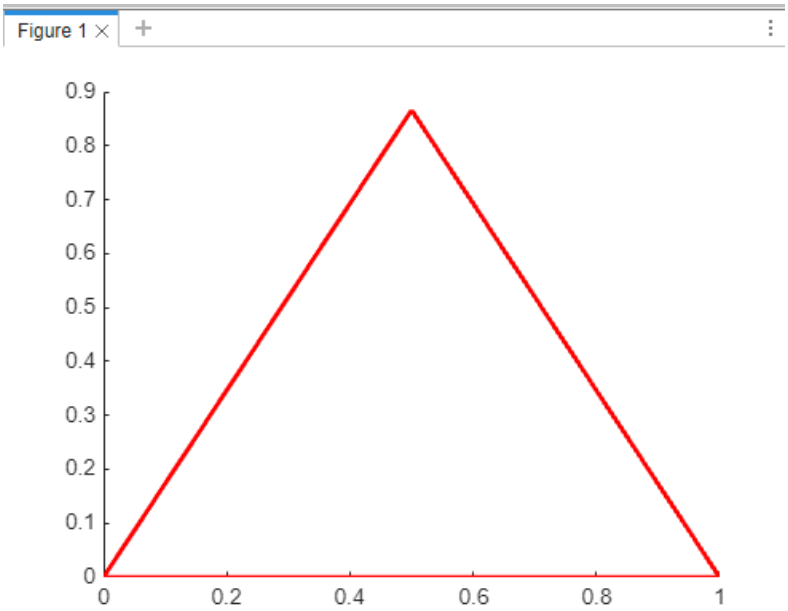
EXAMPLE TRUSS 1:

INPUT:

- Enter the co-ordinates of the nodes in the vector form:
  [0 0;0.5 0.866;1 0]
- Enter the start and end nodes of each element in the vector form:[1 2;2 3;1 3]
- Enter cross-sectional area of the element: 0.01
- Enter modulus of elasticity of the element: 2e+11
- Enter the direction of nodes where freedom is allowed: [1 3 4]
- Number of external loads:
  3
- External load:
  50
- at node(with direction):
  2
- External load:
  -100
- at node(with direction):
  4
- External load:
  50
- at node(with direction):
  6

OUTPUT:

```
----------Nodal Displacements----------
No.  X-Direction     Y-Direction
    1  -1.443e-08   0.000e+00
    2  -7.217e-09   -3.750e-08
    3  0.000e+00   0.000e+00
----------Reactions----------
No.  X-Direction     Y-Direction
    1  0.000e+00   5.000e+01
    2  8.882e-16   -1.000e+02
    3  0.000e+00   5.000e+01
----------Elemental strain & stress----------
No.  Strain  Stress
    1  -2.887e-08   -5.774e+03
    2  -2.887e-08   -5.774e+03
    3  1.443e-08   2.887e+03
```



EXAMPLE TRUSS 2:

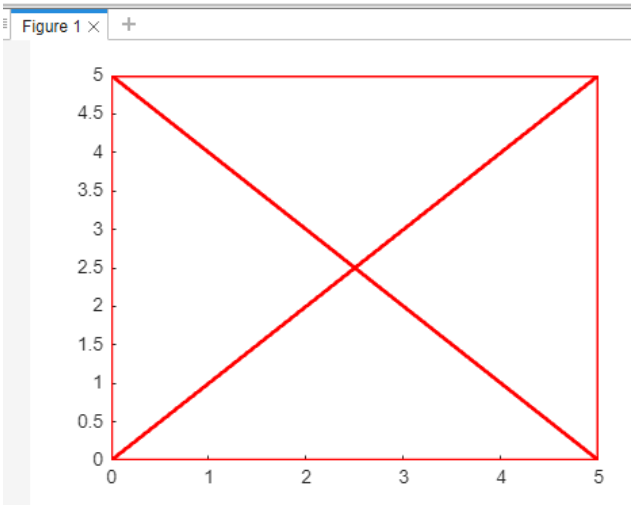
INPUT:

- Enter the coordinates of the nodes in the vector form:
  [5 5;0 5;0 0;5 0]
- Enter the start and end nodes of each element in the vector form:
  [1 2;1 3;1 4;2 3;2 4;3 4]
- Enter cross-sectional area of the element: 0.01
- Enter modulus of elasticity of the element: 2e+11
- Enter the direction of nodes where freedom is allowed: [1 2 3]
- Number of external loads:
  8
- External load:
  5
- at node(with direction):
  1
- External load:
  -10
- at node(with direction):
  2
- External load:
  0
- at node(with direction):
  3
- External load:
  -3.81

- at node(with direction):
  4
- External load:
  -1.19
- at node(with direction):
  5
- External load:
  -1.19
- at node(with direction):
  6
- External load:
  -3.81
- at node(with direction):
  7
- External load:
  15
- at node(with direction):
  8

OUTPUT:

```
----------Nodal Displacements----------
No.  X-Direction     Y-Direction
    1  3.643e-08   -2.798e-08
    2  2.691e-08   0.000e+00
    3  0.000e+00   0.000e+00
    4  0.000e+00   0.000e+00
----------Reactions----------
No.  X-Direction     Y-Direction
    1  5.000e+00   -1.000e+01
    2  -1.776e-15   -3.806e+00
    3  -1.194e+00   -1.194e+00
    4  -3.806e+00   1.500e+01
----------Elemental strain & stress----------
No.  Strain  Stress
    1  1.903e-09   3.806e+02
    2  8.443e-10   1.689e+02
    3  -5.597e-09   -1.119e+03
    4  0.000e+00   0.000e+00
    5  -2.691e-09   -5.383e+02
    6  0.000e+00   0.000e+00
```



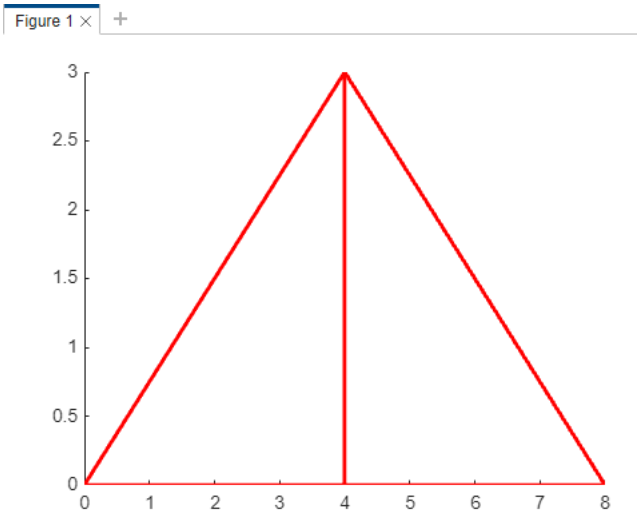
EXAMPLE TRUSS 3:

INPUT:

- Enter the co-ordinates of the nodes in the vector form: [0 0;4 3;4 0;8 0]
- Enter the start and end nodes of each element in the vector form: [1 2;1 3;2 3;2 4;3 4]
- Enter cross-sectional area of the element: 0.01
- Enter modulus of elasticity of the element: 2e+11
- Enter the direction of nodes where freedom is allowed: [3 4 5 6 7]
- Number of external loads: 5
- External load: -12
- at node(with direction): 1
- External load: -14.5
- at node(with direction): 2
- External load: 12
- at node(with direction): 3
- External load: 20
- at node(with direction): 4
- External load: -5.5
- at node(with direction): 8

OUTPUT:

```
----------Nodal Displacements----------
No.  X-Direction     Y-Direction
    1  0.000e+00   0.000e+00
    2  8.771e-09   8.900e-08
    3  -1.467e-08   8.900e-08
    4  -2.933e-08   0.000e+00
----------Reactions----------
No.  X-Direction     Y-Direction
    1  -1.200e+01   -1.450e+01
    2  1.200e+01   2.000e+01
    3  0.000e+00   7.105e-15
    4  3.553e-15   -5.500e+00
----------Elemental strain & stress----------
No.  Strain  Stress
    1  1.208e-08   2.417e+03
    2  -3.667e-09   -7.333e+02
    3  -6.617e-24   -1.323e-12
    4  4.583e-09   9.167e+02
    5  -3.667e-09   -7.333e+02
```



EXAMPLE TRUSS 4:

INPUT:

- Enter the co-ordinates of the nodes in the vector form:
  [0 0;0 5;5 5;5 0]
- Enter the start and end nodes of each element in the vector form:
  [1 2;1 4;2 3;2 4;3 4]
- Enter cross-sectional area of the element: 0.01
- Enter modulus of elasticity of the element: 2e+11
- Enter the direction of nodes where freedom is allowed: [3 4 5 6 7]
- Number of external loads: 5

- External load:

120

- at node(with direction):

1

- External load:

195

- at node(with direction):

2

- External load:

-75

- at node(with direction):

4

- External load:

-120

- at node(with direction):

5

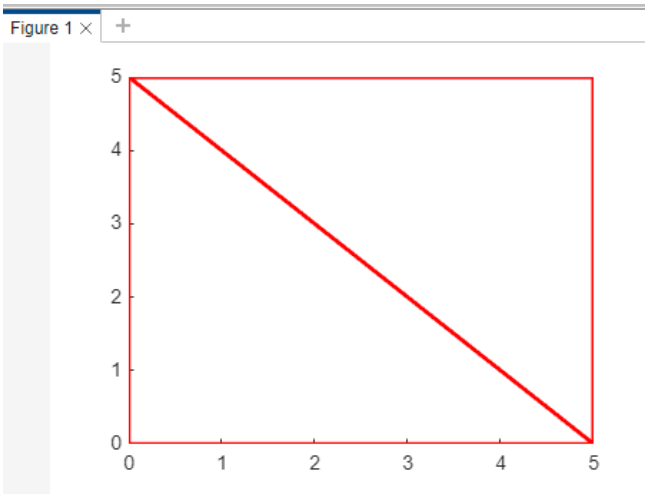
- External load:

-120

- at node(with direction):

8

```
----------Nodal Displacements----------
No.  X-Direction     Y-Direction
    1  0.000e+00   0.000e+00
    2  -1.636e-06   -4.875e-07
    3  -1.936e-06   0.000e+00
    4  -3.000e-07   0.000e+00
----------Reactions----------
No.  X-Direction     Y-Direction
    1  1.200e+02   1.950e+02
    2  -3.553e-14   -7.500e+01
    3  -1.200e+02   0.000e+00
    4  -2.842e-14   -1.200e+02
----------Elemental strain & stress----------
No.  Strain  Stress
    1  -9.750e-08   -1.950e+04
    2  -6.000e-08   -1.200e+04
    3  -6.000e-08   -1.200e+04
    4  8.485e-08   1.697e+04
    5  0.000e+00   0.000e+00
```



EXAMPLE TRUSS 5:

INPUT:

- Enter the co-ordinates of the nodes in the vector form: [0 0;4 4;8 4;12 0;8 0;4 0]
- Enter the start and end nodes of each element in the vector form:

  [1 2;1 6;2 3;2 5;2 6;3 4;3 5;4 5;5 6]
- Enter cross-sectional area of the element: 0.01
- Enter modulus of elasticity of the element: 2e+11
- Enter the direction of nodes where freedom is allowed:

  [3 4 5 6 7 9 10 11 12]
- Number of external loads:

  3
- External load:

  1666.67
- at node(with direction):

  2
- External load:

  3333.33
- at node(with direction):

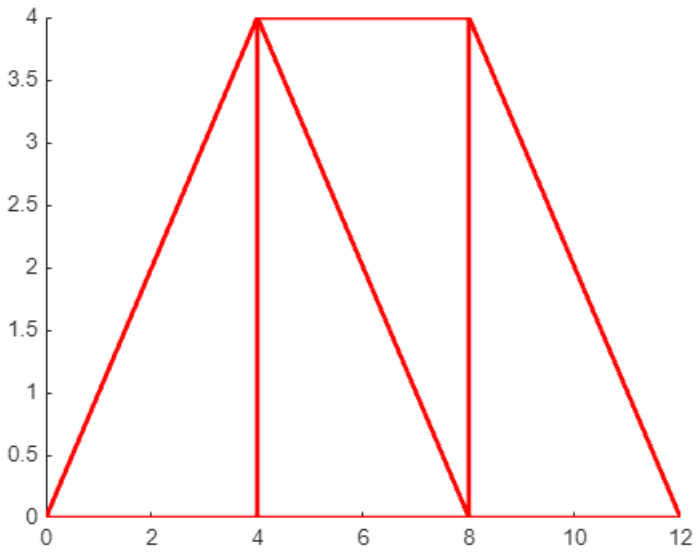
  8
- External load:

  -5000
- at node(with direction):

  10

```
----------Nodal Displacements----------
No.  X-Direction     Y-Direction
    1  0.000e+00   0.000e+00
    2  1.111e-05   -2.054e-05
    3  4.444e-06   -2.775e-05
    4  1.333e-05   0.000e+00
    5  6.667e-06   -3.441e-05
    6  3.333e-06   -2.054e-05
----------Reactions----------
No.  X-Direction     Y-Direction
    1  -1.592e-12   1.667e+03
    2  9.095e-13   -1.819e-12
    3  -4.547e-13   -3.638e-12
    4  -1.364e-12   3.333e+03
    5  1.137e-12   -5.000e+03
    6  0.000e+00   1.819e-12
----------Elemental strain & stress----------
No.  Strain  Stress
    1  -1.179e-06   -2.357e+05
    2  8.333e-07   1.667e+05
    3  -1.667e-06   -3.333e+05
    4  1.179e-06   2.357e+05
    5  -8.470e-22   -1.694e-10
    6  -2.357e-06   -4.714e+05
    7  1.667e-06   3.333e+05
    8  1.667e-06   3.333e+05
    9  8.333e-07   1.667e+05
```

Figure 1



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