2-D Truss Analysis

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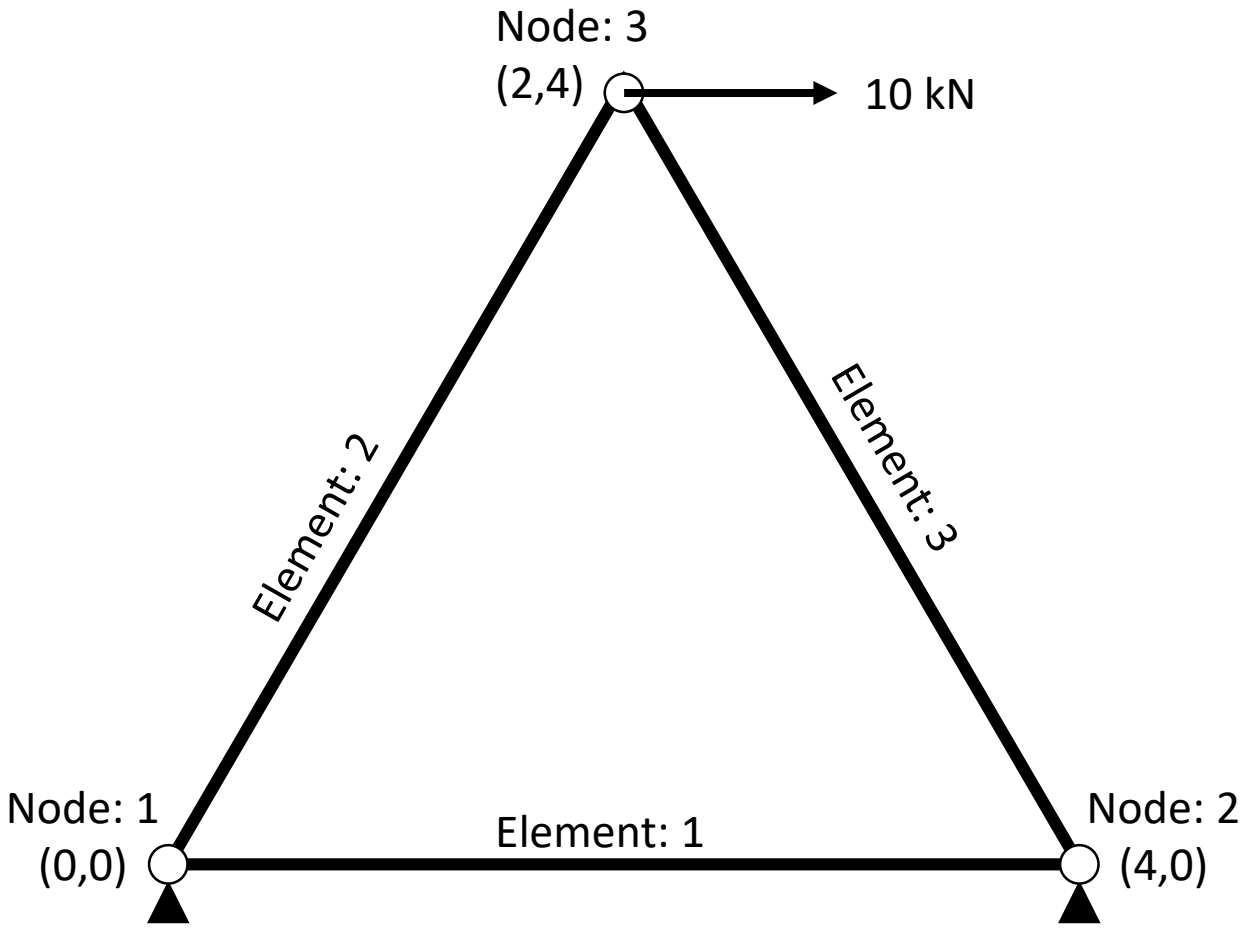
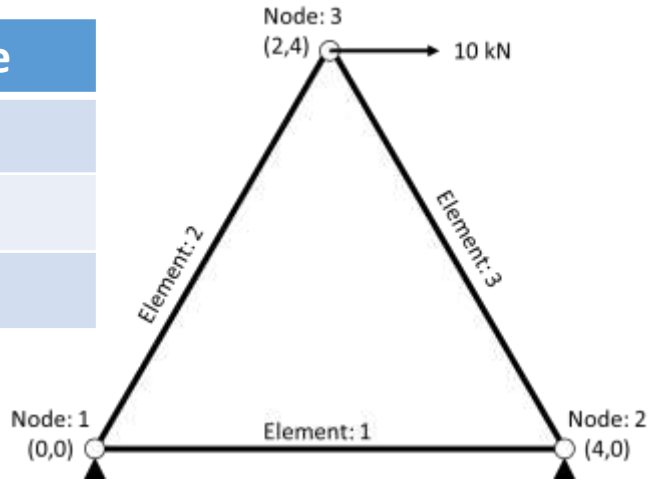
Truss Model to be Analyzed



Nodes Input Data

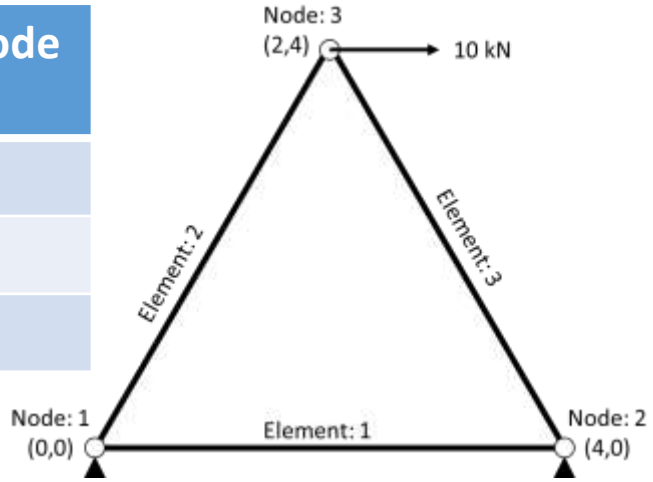
Node ID	X-coordinate	Y-coordinate
1	0	0
2	4	0
3	2	4




```
%Input Truss Data

NN = input('Enter the no. of nodes: ');

%Input Nodal Coordinates
for i = 1:NN
  disp(['Enter the data for node no.',num2str(i),':']);

  X(i) = input('X-Coordinate = ');
  Y(i) = input('Y-Coordinate = ');
end
```

Elements Input Data

Element ID	Mod. Of Elasticity	Area	Start Node	End Node
1	200,000	10	1	2
2	200,000	10	1	3
3	200,000	10	3	2

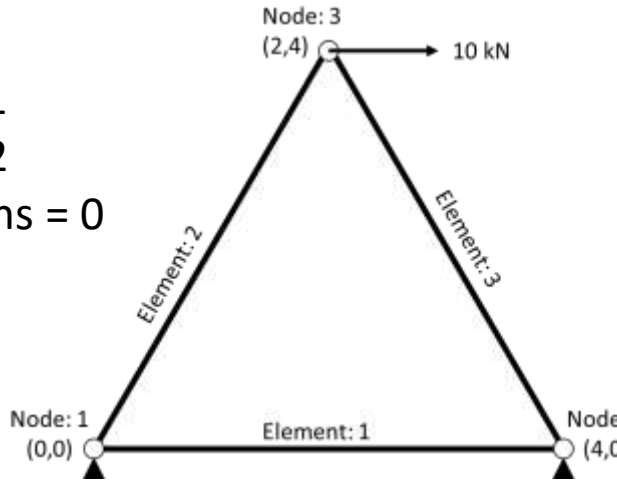



```
NE = input('Enter the no. of elements: ');

%Input Element Data
for j = 1:NE
  disp(['Enter the data for element no.',num2str(j),':']);

  E(j) = input(['Mod of Elasticity = ']);
  A(j) = input(['X-Sectional Area = ']);
  Dir(j,1)=j;
  Dir(j,2)=input(['Start node = ']);
  Dir(j,3)=input(['End node = ']);
end
```

Support Data

Node ID	Type of support
1	0
2	0

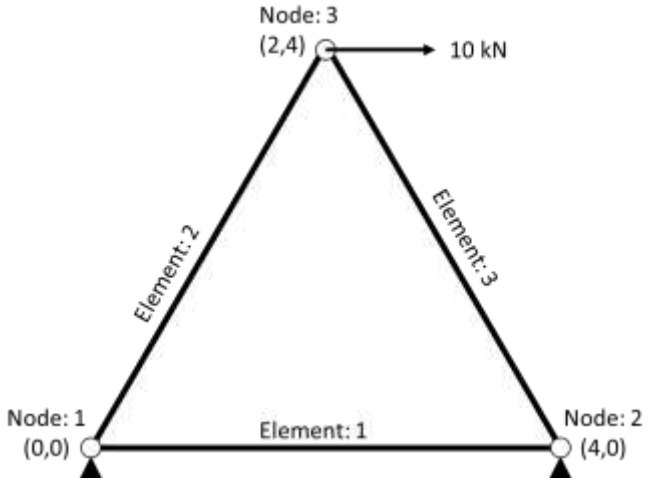
Note:
Restraint in x-direction = 1
Restraint in y-direction = 2
Restraint in both directions = 0




```
%Input of support system

NC = input('Enter the no. of constrained nodes: ');

disp('Please Note');
disp('Entre 1 for x, 2 for y and 0 for both');

for i = 1:NC
  Cons(i,1) = input('Entre the Node ID: ');
  Cons(i,2) = input('Entre the constraint type: ');

end
```

External Force Data

Node ID	Force in x-direction	Force in y-direction
3	10	0




```
%Input of forces applied on nodes

NF = input('Enter the no. of loaded nodes: ');

for i = 1:NF
  Forc(i,1) = input('Entre the Node ID: ');
  Forc(i,2) = input('Entre force in X-Direction: ');
  Forc(i,3) = input('Entre force in Y-Direction: ');

end
```

Global Stiffness Matrix of Each Element

```
%Definition of Global stiffness submatrices for each element:
for i=1:NE
L(i)=sqrt((X(Dir(i,3))-X(Dir(i,2)))^2+(Y(Dir(i,3))-
Y(Dir(i,2)))^2);
cos(i)=(X(Dir(i,3))-X(Dir(i,2)))/L(i);
sin(i)=(Y(Dir(i,3))-Y(Dir(i,2)))/L(i);
end

for i=1:NE
S(i)=E(i)*A(i)/L(i);
k11(:,:,i)=S(i)*[(cos(i))^2 sin(i)*cos(i);sin(i)*cos(i) (sin(i))^2];
k12(:,:,i)=-k11(:,:,i);
k21(:,:,i)=k12(:,:,i);
k22(:,:,i)=k11(:,:,i);
end
```

Structure Stiffness Matrix

```
%Definition of structure stiffness matrix(plant of
submatrices):
K=zeros(2*NN,2*NN);

for n=1:NE
 i=Dir(n,2);
 j=Dir(n,3);
 K(2*i-1:2*i,2*i-1:2*i) = k11(:,:,n)+ K(2*i-1:2*i,2*i-1:2*i);
 K(2*i-1:2*i,2*j-1:2*j) = k12(:,:,n);
 K(2*j-1:2*j,2*i-1:2*i) = k21(:,:,n);
 K(2*j-1:2*j,2*j-1:2*j) = k22(:,:,n)+ K(2*j-1:2*j,2*j-1:2*j);
end
```

External Force Vector

```
%Definition of primary external nodal forces vector:
F=zeros(2*NN,1);
for i=1:NF
  r=2*Forc(i,1);
  F(r-1)=Forc(i,2);
  F(r)-Forc(i,3);
end
```