Computer Implementation 1.1 *(Matlab)* *Plane truss element (p. 7)*

The function for generating plane truss element equations can be implemented in *Matlab* in essentially the same way as that in *Mathematica*. Here is the *PlaneTrussElement* function in Matlab. The Matlab syntax requires that each function be saved in a separate text file with the name of the file same as that function name except with a ".m" extension.

MatlabFiles\Chap1\PlaneTrussElement.m

```
function k=PlaneTrussElement(e,A,coord)
% PlaneTrussElement(e,A,coord)
% Generates stiffness matrix for a plane truss element
% e=modulus of elasticity
% A=area of cross-section
% coord=coordinates at the element ends

x1=coord(1,1);y1=coord(1,2);
x2=coord(2,1);y2=coord(2,2);
L=sqrt((x2-x1)^2+(y2-y1)^2);
ls=(x2-x1)/L;ms=(y2-y1)/L;
k=e*A/L*[ls^2,ls*ms,-ls^2,-ls*ms;
        ls*ms,ms^2,-ls*ms,-ms^2;
        -ls^2,-ls*ms,ls^2,ls*ms;
        -ls*ms,-ms^2,ls*ms,ms^2];
```

For element number 6 (say with $E = 29 \times 10^6\ \text{lb}/\text{in}^2$ and $A = 2.5\ \text{in}^2$) of the transmission tower the equations are obtained as follows.

MatlabFiles\Chap1\TrussElementEx1.m

```
nodes=12*[-7.5,0;7.5,0;-7.5,15;
        7.5,15;-5,25;5,25;-5,35;5,35;-15,40;15,40;
        -25,45;-15,45;-5,45;5,45;15,45;25,45];
PlaneTrussElement(29000000,2.5,nodes([3 5],:))
```

```
>> TrussElementEx1

ans =

  1.0e+005 *

    0.3448    1.3791   -0.3448   -1.3791
    1.3791    5.5165   -1.3791   -5.5165
   -0.3448   -1.3791    0.3448    1.3791
   -1.3791   -5.5165    1.3791    5.5165
```