Computer Implementation 1.5 *(Matlab)* *5 bar truss assembly (p. 28)*

Use *Matlab* to develop element equations and assemble them to form global equations for five bar plane truss. The complete procedure, with data in N-mm units, is as follows.

MatlabFiles\Chap1\TrussAssemblyEx.m

```
% Truss Assembly Example
e1=200*10^3; e2=70*10^3; a1=40*100; a2=30*100; a3=20*100;
P = 150*10^3;
nodes = 1000*[0, 0; 1.5, 3.5; 0, 5; 5, 5];
K=zeros(8);
% Generate stiffness matrix for each element and assemble it.
k=PlaneTrussElement(e1, a1, nodes([1 2],:));
lm=[1, 2, 3, 4];
K(lm, lm) = K(lm, lm) + k;

k=PlaneTrussElement(e1, a1, nodes([2 4],:));
lm=[3, 4, 7, 8];
K(lm, lm) = K(lm, lm) + k;

k=PlaneTrussElement(e1, a2, nodes([1 3],:));
lm=[1, 2, 5, 6];
K(lm, lm) = K(lm, lm) + k;

k=PlaneTrussElement(e1, a2, nodes([3 4],:));
lm=[5, 6, 7, 8];
K(lm, lm) = K(lm, lm) + k;

k=PlaneTrussElement(e2, a3, nodes([2 3],:));
lm=[3, 4, 5, 6];
K(lm, lm) = K(lm, lm) + k

% Define the load vector
R = zeros(8,1); R(4)=-P
```

For each element the PlaneTrussElement function defined in *Matlab* Implementation 1.1 is first used to generate element stiffness matrix, k. From the degrees of freedom the assembly location vector lm for the element is then defined. The assembly is then carried out by the statement K(lm, lm) = K(lm, lm) + k. To conserve space printing of most intermediate results is suppressed by ending statements with a semicolon. If desired, the intermediate results can be seen by executing statements with the semicolon removed. The global load vector is written directly.

```
>>

K =

  1.0e+005 *

  Columns 1 through 7

    0.3260    0.7607   -0.3260   -0.7607         0         0         0
    0.7607    2.9749   -0.7607   -1.7749         0   -1.2000         0
   -0.3260   -0.7607    2.4309    1.1914   -0.3300    0.3300   -1.7749
   -0.7607   -1.7749    1.1914    2.4309    0.3300   -0.3300   -0.7607
         0         0   -0.3300    0.3300    1.5300   -0.3300   -1.2000
         0   -1.2000    0.3300   -0.3300   -0.3300    1.5300         0
         0         0   -1.7749   -0.7607   -1.2000         0    2.9749
```

```
         0         0   -0.7607   -0.3260         0         0    0.7607

  Column 8

         0
         0
   -0.7607
   -0.3260
         0
         0
    0.7607
    0.3260


R =

           0
           0
           0
     -150000
           0
           0
           0
           0
```