

### Computer Implementation 4.1 (*Matlab*) *Plane truss* (p. 227)

The analysis of plane trusses can be performed conveniently by the two small *Matlab* functions (PlaneTrussElement and PlaneTrussResults) presented in Chapter 1. Using these functions now we consider solution of the six bar truss shown in Figure 4.XXX. The steps are exactly those explained in similar examples in Chapter 1.

#### MatlabFiles\Chap4\SixBarTrussEx.m

```
% Six bar truss example
e = 200*10^3; A = 0.001*1000^2; P = 20000.;
alpha = pi/6;
nodes = 1000*[0, 0; 4, 0; 0, 3; 4, 3; 2, 2];
dof=2*length(nodes);
conn=[1,2; 2,5; 5,3; 2,4; 1,5; 5,4];
Imm = [1, 2, 3, 4; 3, 4, 9, 10; 9, 10, 5, 6;
       3, 4, 7, 8; 1, 2, 9, 10; 9, 10, 7, 8];
elems=size(Imm,1);
K=zeros(dof); R = zeros(dof,1);
debc = [1, 2, 5, 6, 7, 8];
ebcVals = zeros(length(debc),1);

%load vector
R = zeros(dof,1); R(3) = P*sin(alpha); R(4) = P*cos(alpha);

% Assemble global stiffness matrix
K=zeros(dof);
for i=1:elems
    lm=Imm(i,:);
    con=conn(i,:);
    k=PlaneTrussElement(e, A, nodes(con,:));
    K(lm, lm) = K(lm, lm) + k;
end
K
R
% Nodal solution and reactions
[d, reactions] = NodalSoln(K, R, debc, ebcVals)
results=[];
for i=1:elems
    results = [results; PlaneTrussResults(e, A, ...
        nodes(conn(i,:),:), d(Imm(i,:)))];
end
format short g
results
```

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>> SixBarTrussEx

K =

Columns 1 through 6

85355	35355	-50000	0	0	0
35355	35355	0	0	0	0
-50000	0	85355	-35355	0	0
0	0	-35355	1.0202e+005	0	0
0	0	0	0	71554	-35777
0	0	0	0	-35777	17889
0	0	0	0	0	0
0	0	0	-66667	0	0
-35355	-35355	-35355	35355	-71554	35777
-35355	-35355	35355	-35355	35777	-17889

Columns 7 through 10

0	0	-35355	-35355
0	0	-35355	-35355
0	0	-35355	35355
0	-66667	35355	-35355
0	0	-71554	35777
0	0	35777	-17889
71554	35777	-71554	-35777
35777	84555	-35777	-17889
-71554	-35777	2.1382e+005	0
-35777	-17889	0	1.0649e+005

R =

0
0
10000
17321
0
0
0
0
0
0

d =

---

---

```
0
0
0.21311
0.24998
0
0
0
0
-0.0060971
0.012242
```

```
reactions =
```

```
-10873
-217.27
874.27
-437.13
-1.7279
-16666
```

```
results =
```

```
5.3276e-005  10.655  10655
-4.6334e-006 -0.92669 -926.69
-4.8873e-006 -0.97746 -977.46
-8.3326e-005 -16.665  -16665
1.5363e-006  0.30727  307.27
-9.659e-009 -0.0019318 -1.9318
```

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