```
clear
clc

% Constants
L_A = 9;
L_B = 12;
L_C = 9;
L_D = sqrt(9^2 + 12^2);
theta_A = atand(9/0);
theta_B = atand(0/12);
theta_C = atand(9/0);
theta_D = atand(-9/12);

diam = 0.25;
CsA = pi * diam^2 / 4; % Cross sectional area
E = 30e6;

F_2x = 55;
F_2y = 0;
F_3x = 40;
F_3y = -30;

K_local = [ 1 0 -1 0; 0 0 0 0; -1 0 1 0; 0 0 0 0];

% Calc k in global cords for each memeber
[T_A, K_A] = kglobal(theta_A, L_A, CsA, E);
[T_B, K_B] = kglobal(theta_B, L_B, CsA, E);
[T_C, K_C] = kglobal(theta_C, L_C, CsA, E);
[T_D, K_D] = kglobal(theta_D, L_D, CsA, E);

%Assemble the Global K matrix
K_global = [K_A(1,1), K_A(1,2), K_A(1,3), K_A(1,4), 0, 0, 0, 0;
            K_A(2,1), K_A(2,2), K_A(2,3), K_A(2,4), 0, 0, 0, 0;
            K_A(3,1), K_A(3,2), K_A(3,3) + K_B(1,1) + K_D(1,1), K_A(3,4) +
K_B(1,2) + K_D(1,2), K_B(1,3), K_B(1,4), K_D(1,3), K_D(1,4);
            K_A(4,1), K_A(4,2), K_A(4,3) + K_B(2,1) + K_D(2,1), K_A(4,4) +
K_B(2,2) + K_D(2,2), K_B(2,3), K_B(2,4), K_D(2,3), K_D(2,4);
            0, 0, K_B(3,1), K_B(3,2), K_B(3,3) + K_C(1,1), K_B(3,4) +
K_C(1,2), K_C(1,3), K_C(1,4);
            0, 0, K_B(4,1), K_B(4,2), K_B(4,3) + K_C(2,1), K_B(4,4) +
K_C(2,2), K_C(2,3), K_C(2,4);
            0, 0, K_D(3,1), K_D(3,2), K_C(3,1), K_C(3,2), K_C(3,3) +
K_D(3,3), K_C(3,4) + K_D(3,4);
            0, 0, K_D(4,1), K_D(4,2), K_C(4,1), K_C(4,2), K_C(4,3) +
K_D(4,3), K_C(4,4) + K_D(4,4);];
K_check = sum(K_global)

%Recuded system of equations based on boundary conditions
F_bndry = [F_2x;F_2y;F_3x;F_3y;];
K_bndry = K_global(3:6,3:6);

%Solve for unknown displacments
```

```
xySolve_1 = K_bndry\F_bndry;

%Construct full displacment vector in global cords
xySolve_2 = [0;0;xySolve_1(1);xySolve_1(2);xySolve_1(3);xySolve_1(4);0;0;]

%Calculate reaction forces
F_react = K_global * xySolve_2

%Find local displacments for each element
%local x_local=transfor*X_gloabal
X_local_A = T_A*[xySolve_2(1:4)];
X_local_B = T_B*[xySolve_2(3:6)];
X_local_C = T_C*[xySolve_2(5:8)];
X_local_D = T_D*[xySolve_2(3:4);xySolve_2(7:8)];

%Calculate axial force
F_axial_A = (E*CsA/L_A)*K_local*X_local_A;
F_axial_B = (E*CsA/L_B)*K_local*X_local_B;
F_axial_C = (E*CsA/L_C)*K_local*X_local_C;
F_axial_D = (E*CsA/L_D)*K_local*X_local_D;

%Calculate stress
stress_A = F_axial_A/CsA
stress_B = F_axial_B/CsA
stress_C = F_axial_C/CsA
stress_D = F_axial_D/CsA
```

```
K_check =

   1.0e-10 *

  Columns 1 through 7

         0         0    0.0728   -0.1455         0         0         0

  Column 8

         0
```

```
xySolve_2 =

         0
         0
    0.0018
    0.0004
    0.0022
   -0.0002
         0
         0
```

```
F_react =
```

```
         0
  -71.2500
   55.0000
   -0.0000
   40.0000
  -30.0000
  -95.0000
  101.2500


stress_A =

   1.0e+03 *

   -1.4515
         0
    1.4515
         0


stress_B =

 -814.8733
         0
  814.8733
         0


stress_C =

 -611.1550
         0
  611.1550
         0


stress_D =

   1.0e+03 *

    2.4192
         0
   -2.4192
         0
```

Published with MATLAB® R2023b