



DOKUZ EYLÜL ÜNİVERSİTESİ MÜHENDİSLİK FAKÜLTESİ
MAKİNA MÜHENDİSLİĞİ
MAK4085 SONLU ELEMANLARA GİRİŞ DERSİ DÖNEM
PROJESİ

HAZIRLAYANLAR

Tarık ACET - 2020485001

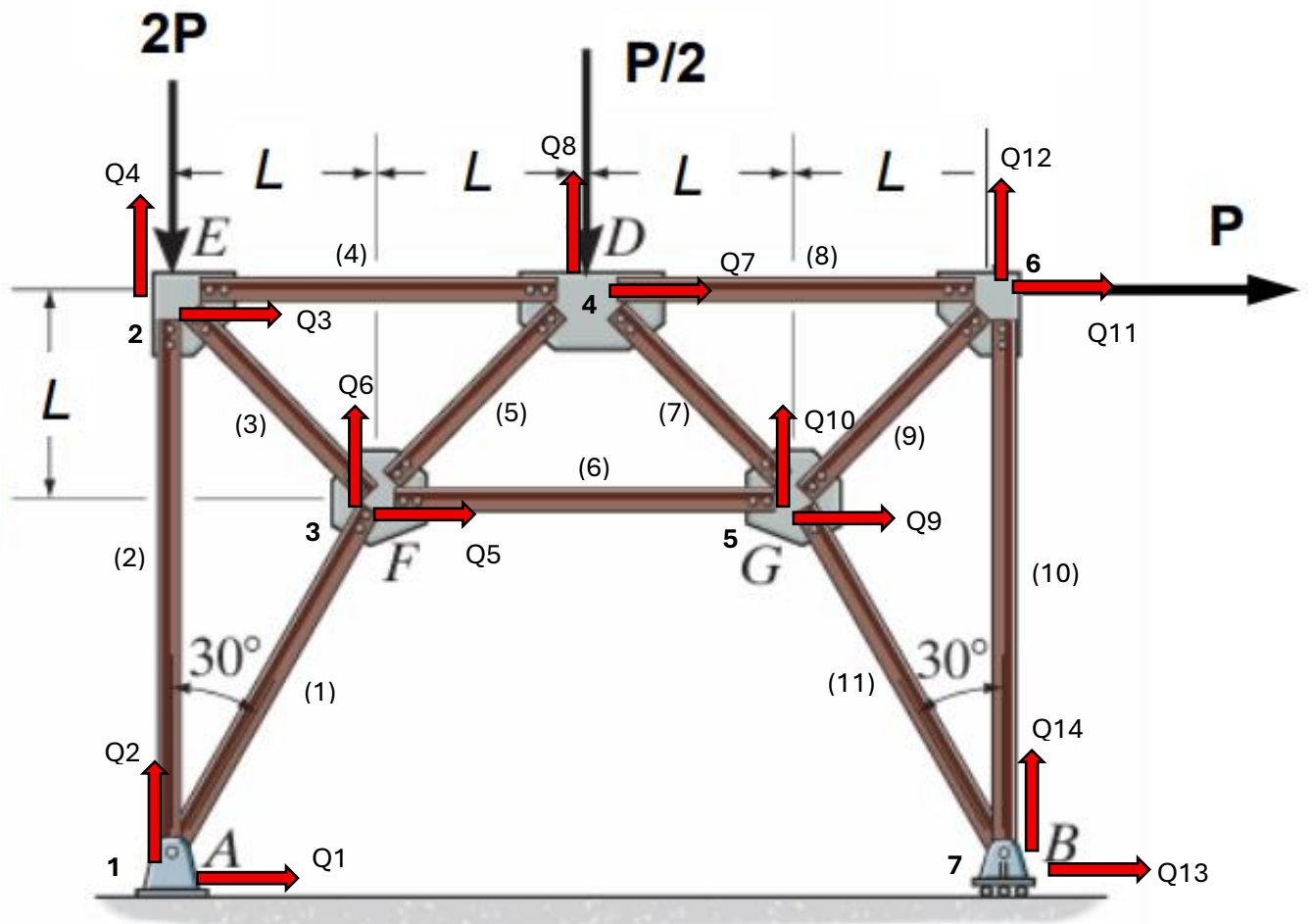
Tunahan ARSLAN - 2021485005

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Kafes Sistemi Genel Bilgileri



Kafes Sistemi Genel Bilgileri	
Malzeme	Çelik
Elastite Modülü	200 Gpa
Poisson Oranı	0.3
Yoğunluk	7850 kg/m ³
Kesit Alanı	0,01 m ²
Eleman Sayısı	11
Düğüm Sayısı	7
P	1,9 kN
L	2,3 m

Tablo 1. Kafes sisteminin genel özellikleri

	X Koordinatı	Y Koordinatı
Düğüm 1	0	0
Düğüm 2	0	6,2837
Düğüm 3	2,3	3,9837
Düğüm 4	4,6	6,2837
Düğüm 5	6,8	3,9837
Düğüm 6	9,2	6,2837
Düğüm 7	9,2	0

Tablo 2. Düğümlerin genel koordinatlara göre konumları

	1. Düğüm	2. Düğüm	Le	L	M
Eleman 1	1	2	6,2837	0	1
Eleman 2	1	3	4,6	0,5	0,8660217
Eleman 3	2	3	3,2526	0,7071266	-0,7071266
Eleman 4	2	4	4,6	1	0
Eleman 5	3	4	3,2526	0,7071266	0,7071266
Eleman 6	3	5	4,6	0,9782609	0
Eleman 7	4	5	3,2526	0,676382	-0,7071266
Eleman 8	4	6	4,6	1	0
Eleman 9	5	6	3,2526	0,7378712	0,7071266
Eleman 10	6	7	6,2837	0	-1
Eleman 11	5	7	4,6	0,5217391	-0,8660217

Tablo 3. Doğrultman kosinüsleri

Teorik Bilgiler

Eleman Uzunlukları

$$l_e = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Doğrultman Kosinüsleri

$$l = \frac{x_2 - x_1}{l_e} \quad m = \frac{y_2 - y_1}{l_e}$$

Global Koordinatlarda Eleman Direngenlik Matrisi

$$k = \frac{A_e E_e}{l_e} \begin{bmatrix} l^2 & lm & -l^2 & -lm \\ lm & m^2 & -lm & -m^2 \\ -l^2 & -lm & l^2 & lm \\ -lm & -m^2 & lm & m^2 \end{bmatrix}$$

Gerilme

$$\sigma = \frac{E_e}{l_e} [-l \quad -m \quad l \quad m] q$$

MATLAB Çözümleri

Eleman direngenlik ve global direngenlik matrisleri, kafesin düğümlere ait yer değiştirmelerini, eleman gerilme değerleri ve reaksiyon kuvvetlerinin hesaplarını içeren MATLAB kod aşağıdadır.

```
clear; clc;
```

```
% Parametreler
```

```
P = 1.9e3;
```

```
E = 200e9;
```

```
A = 0.01;
```

```
% Düğüm Noktaları ve Elemanlar
```

```
nodes=[0 0;0 6.2837;2.3 3.9837;4.6 6.2837;6.9 3.9837;9.2 6.2837;9.2 0];
```

```
elements=[1 2;1 3;2 3;2 4;3 4;3 5;4 5;4 6;5 6;6 7;5 7];
```

```
numNodes = size(nodes,1);
```

```
numElems = size(elements,1);
```

```
DOF = 2;
```

```
% Yükler
```

```
F = zeros(numNodes*DOF,1);
```

```
F(4) = -2*P;
```

```
F(8) = -0.5*P;
```

```
F(11) = P;
```

```
% Sınır şartları
```

```
fixedDOFs = [1 2 14];
```

```
freeDOFs = setdiff(1:numNodes*DOF,fixedDOFs);
```

```
% Küresel rijitlik matrisi
```

```
K_global = zeros(numNodes*DOF);
```

```
fprintf('\n--- ELEMAN RIJITLIK MATRİSLERİ (k) ---\n');
```

```

for k = 1:numElems
    n1 = elements(k,1);
    n2 = elements(k,2);

    x1 = nodes(n1,1); y1 = nodes(n1,2);
    x2 = nodes(n2,1); y2 = nodes(n2,2);

    Le = sqrt((x2-x1)^2 + (y2-y1)^2);
    l = (x2-x1)/Le;
    m = (y2-y1)/Le;

    ke = (E*A/Le) * ...
        [ l^2   l*m   -l^2   -l*m;
          l*m   m^2   -l*m   -m^2;
          -l^2  -l*m   l^2    l*m;
          -l*m  -m^2   l*m    m^2 ];

% Eleman rijitlik matrisi çıktısı
fprintf('\nEleman %d (%d-%d)\n',k,n1,n2);
disp(ke)

% Global montaj
dof = [2*n1-1 2*n1 2*n2-1 2*n2];
K_global(dof,dof) = K_global(dof,dof) + ke;
end

% Çözüm
U = zeros(numNodes*DOF,1);
K_red = K_global(freeDOFs,freeDOFs);
F_red = F(freeDOFs);

U(freeDOFs) = K_red\F_red;
R = K_global*U - F;

```

% Reaksiyonlar

```
fprintf('\n===== MESNET REAKSİYONLARI =====\n');
fprintf('DOF\tDüğüm\tYön\tReaksiyon (kN)\n');
fprintf('-----\n');
for i = fixedDOFs
    node = ceil(i/2);
    if mod(i,2)==1
        dir = 'X';
    else
        dir = 'Y';
    end
    fprintf('%2d\t%2d\t %s\t%10.4f\n', i, node, dir, R(i)/1000);
end
```

% Deplasmanlar

```
fprintf('\n===== DÜĞÜM DEPLASMANLARI =====\n');
fprintf('Düğüm\tUx (mm)\tUy (mm)\n');
fprintf('-----\n');

for i = 1:numNodes
    fprintf('%2d\t%10.4f\t%10.4f\n', ...
        i, U(2*i-1)*1000, U(2*i)*1000);
end
```

% Eleman Kuvvetleri ve Gerilmeleri

```

fprintf('\n===== ELEMEN KUVVETLERİ VE GERİLMELER =====\n');
fprintf('Eleman\tBağlantı\tKuvvet (kN)\tGerilme (Pa)\tDurum\n');
fprintf('-----\n');

for k = 1:numElems
    n1 = elements(k,1);
    n2 = elements(k,2);

    x1 = nodes(n1,1); y1 = nodes(n1,2);
    x2 = nodes(n2,1); y2 = nodes(n2,2);

    Le = sqrt((x2-x1)^2 + (y2-y1)^2);
    l = (x2-x1)/Le;
    m = (y2-y1)/Le;

    delta = (U(2*n2-1)-U(2*n1-1))*l + ...
            (U(2*n2)-U(2*n1))*m;

    force = (E*A/Le)*delta;
    stress = force/A;
    if force >= 0
        durum = 'Çekme';
    else
        durum = 'Basma';
    end
    fprintf('%2d\t %d-%d\t\t%8.3f\t%10.2e\t%s\n', ...
            k, n1, n2, force/1000, stress, durum);
end
disp(K_global)

```

Elemanları Direngenlik Matrisleri

Eleman 1 (1-2)

1.0e+08 *

0	0
0	3.1828
0	0
0	-3.1828

Eleman 2 (1-3)

1.0e+08 *

1.0870	1.8827	-1.0870	-1.8827
1.8827	3.2609	-1.8827	-3.2609
-1.0870	-1.8827	1.0870	1.8827
-1.8827	-3.2609	1.8827	3.2609

Eleman 3 (2-3)

1.0e+08 *

3.0744	-3.0744	-3.0744	3.0744
-3.0744	3.0744	3.0744	-3.0744
-3.0744	3.0744	3.0744	-3.0744
3.0744	-3.0744	-3.0744	3.0744

Eleman 4 (2-4)

1.0e+08 *

4.3478	0	-4.3478	0
0	0	0	0
-4.3478	0	4.3478	0
0	0	0	0

Eleman 5 (3-4)

1.0e+08 *

3.0744	3.0744	-3.0744	-3.0744
3.0744	3.0744	-3.0744	-3.0744
-3.0744	-3.0744	3.0744	3.0744
-3.0744	-3.0744	3.0744	3.0744

Eleman 6 (3-5)

1.0e+08 *

4.3478	0	-4.3478	0
0	0	0	0
-4.3478	0	4.3478	0
0	0	0	0

Eleman 7 (4-5)

1.0e+08 *

3.0744	-3.0744	-3.0744	3.0744
-3.0744	3.0744	3.0744	-3.0744
-3.0744	3.0744	3.0744	-3.0744
3.0744	-3.0744	-3.0744	3.0744

Eleman 8 (4-6)

1.0e+08 *

4.3478	0	-4.3478	0
0	0	0	0
-4.3478	0	4.3478	0
0	0	0	0

Eleman 9 (5-6)

1.0e+08 *

3.0744	3.0744	-3.0744	-3.0744
3.0744	3.0744	-3.0744	-3.0744
-3.0744	-3.0744	3.0744	3.0744
-3.0744	-3.0744	3.0744	3.0744

Eleman 10 (6-7)

1.0e+08 *

0	0	0	0
0	3.1828	0	-3.1828
0	0	0	0
0	-3.1828	0	3.1828

Eleman 11 (5-7)

1.0e+08 *

1.0870	-1.8827	-1.0870	1.8827
-1.8827	3.2609	1.8827	-3.2609
-1.0870	1.8827	1.0870	-1.8827
1.8827	-3.2609	-1.8827	3.2609

Global Direngenlik Matrisi

1.0e+09 *

0.1087	0.1883	0	0	-0.1087	-0.1883	0	0	0	0	0	0
0.1883	0.6444	0	-0.3183	-0.1883	-0.3261	0	0	0	0	0	0
0	0	0.7422	-0.3074	-0.3074	0.3074	-0.4348	0	0	0	0	0
0	-0.3183	-0.3074	0.6257	0.3074	-0.3074	0	0	0	0	0	0
-0.1087	-0.1883	-0.3074	0.3074	1.1584	0.1883	-0.3074	-0.3074	-0.4348	0	0	0
-0.1883	-0.3261	0.3074	-0.3074	0.1883	0.9410	-0.3074	-0.3074	0	0	0	0
0	0	-0.4348	0	-0.3074	-0.3074	1.4844	-0.0000	-0.3074	0.3074	-0.4348	0
0	0	0	0	-0.3074	-0.3074	-0.0000	0.6149	0.3074	-0.3074	0	0
0	0	0	0	-0.4348	0	-0.3074	0.3074	1.1584	-0.1883	-0.3074	-0.3074
0	0	0	0	0	0	0.3074	-0.3074	-0.1883	0.9410	-0.3074	-0.3074
0	0	0	0	0	0	-0.4348	0	-0.3074	-0.3074	0.7422	0.3074
0	0	0	0	0	0	0	0	-0.3074	-0.3074	0.3074	0.6257
0	0	0	0	0	0	0	0	-0.1087	0.1883	0	0
0	0	0	0	0	0	0	0	0.1883	-0.3261	0	-0.3183

Düğümlerin Yer Değiştirmeleri

Düğüm	Ux (mm)	Uy (mm)
1	0.0000	0.0000
2	0.0826	-0.0197
3	0.0764	-0.0340
4	0.0770	-0.0319
5	0.0845	-0.0186
6	0.0773	-0.0056
7	0.1167	0.0000

Eleman Gerilme Değerleri

===== ELEMAN KUVVETLERİ VE GERİLMELER =====

Eleman	Bağlantı	Kuvvet (kN)	Gerilme (Pa)	Durum
1	1-2	-6.268	-6.27e+05	Basma
2	1-3	3.800	3.80e+05	Çekme
3	2-3	3.491	3.49e+05	Çekme
4	2-4	-2.468	-2.47e+05	Basma
5	3-4	1.164	1.16e+05	Çekme
6	3-5	3.545	3.55e+05	Çekme
7	4-5	-2.507	-2.51e+05	Basma
8	4-6	0.127	1.27e+04	Çekme
9	5-6	2.507	2.51e+05	Çekme
10	6-7	-1.773	-1.77e+05	Basma
11	5-7	-0.000	-1.47e-10	Basma

Reaksiyon Kuvvetleri

1 nolu düğüm ankastre mesnetle bağlanmışken 7 nolu düğüm x yönünde kayar mesnet ile bağlanmıştır. Bu sebeple Q1, Q2, Q13 yönlerinde reaksiyon kuvvetleri oluşur.

===== MESNET REAKSİYONLARI =====			
DOF	Düğüm	Yön	Reaksiyon (kN)

1	1	X	-1.9000
2	1	Y	2.9773
14	7	Y	1.7727

Kafes sisteminin emniyet durumunu incelemek istek elemanlarda oluşan gerilim değerlerine bakmak gerekir. En büyük gerilme kuvvetine bakarsak 0,6268 MPa değerinde 1. Elemanda gerçekleşmektedir. Çeliğin akma değeri 220 MPa olduğunda bu kafes belirlenen kesit alanında istenilen P kuvvetlerini emniyetli bir şekilde taşıyabilir.

ANSYS MECHANICAL APDL Analizleri

ANSYS Mechanical APDL kullanılarak kafes sistemi simüle edilmiştir. LINK180 elemanı kullanılarak düğüm yer değiştirmeler MATLAB programının çıktıları ile karşılaştırılmıştır.

```
PRINT U      NODAL SOLUTION PER NODE

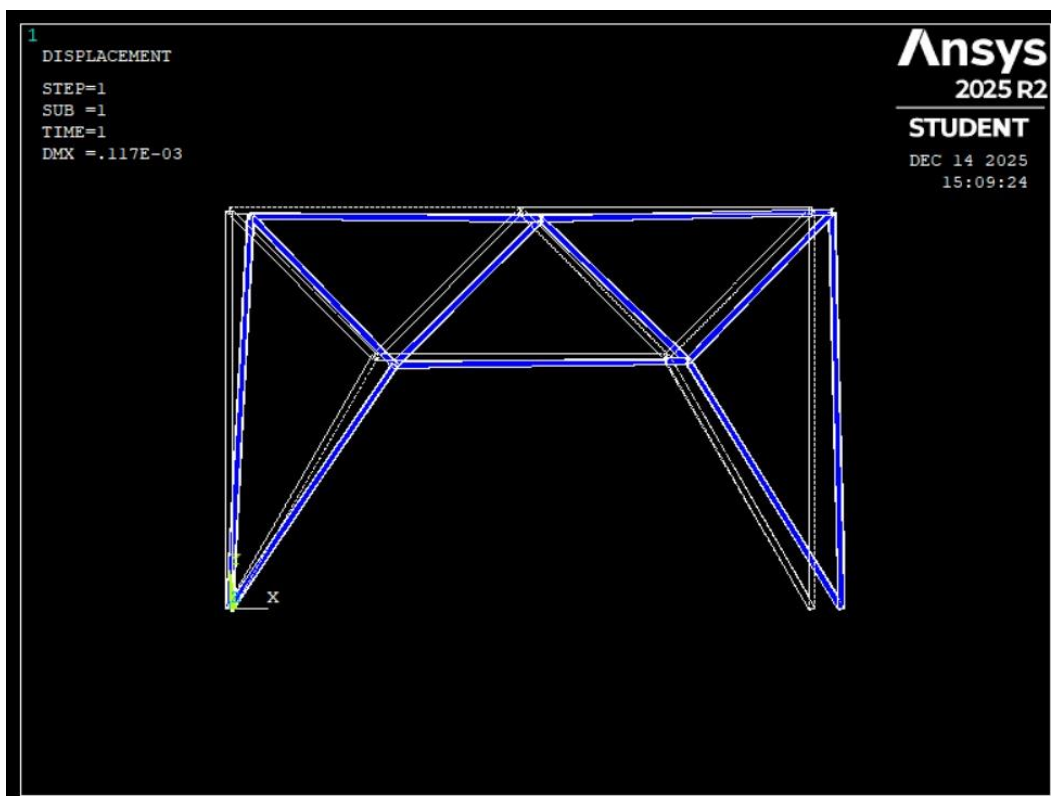
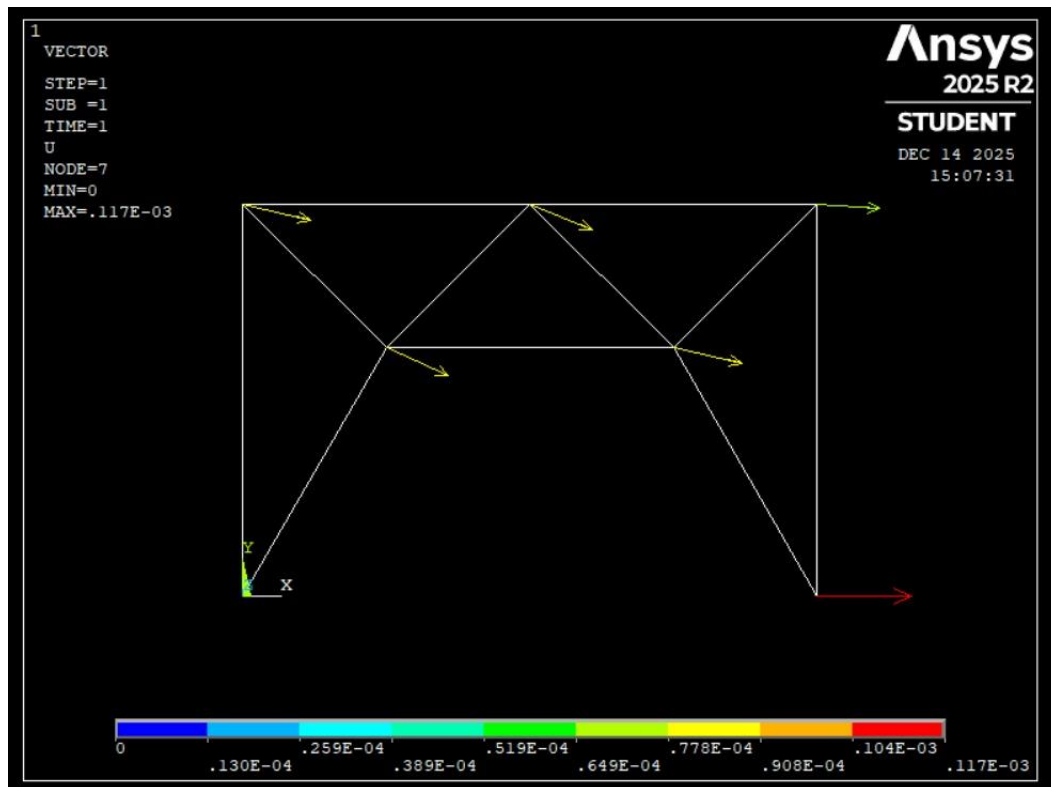
**** POST1 NODAL DEGREE OF FREEDOM LISTING ****

LOAD STEP=    1 SUBSTEP=    1
TIME=    1.0000 LOAD CASE=    0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

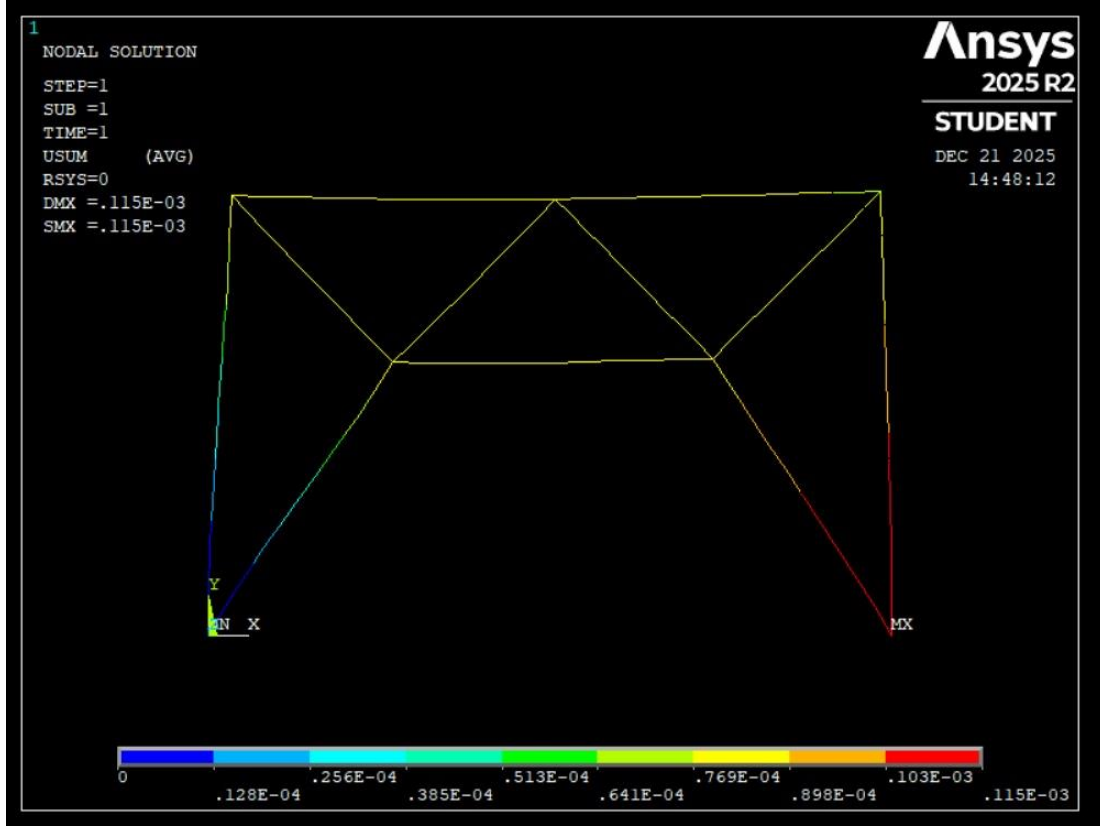
)
  NODE      UX      UY      UZ      USUM
    1      0.0000      0.0000      0.0000      0.0000
    2      0.82641E-004-0.19694E-004      0.0000      0.84955E-004
    3      0.76365E-004-0.33997E-004      0.0000      0.83591E-004
    4      0.76964E-004-0.31920E-004      0.0000      0.83321E-004
    5      0.84519E-004-0.18599E-004      0.0000      0.86542E-004
    6      0.77257E-004-0.55696E-005      0.0000      0.77457E-004
    7      0.11673E-003      0.0000      0.0000      0.11673E-003

MAXIMUM ABSOLUTE VALUES
NODE          7          3          0          7
VALUE      0.11673E-003-0.33997E-004      0.0000      0.11673E-003
```



LINK180 yerine BEAM188 elemanı kullanılarak aynı kesit alanına sahip dikdörtgen ve I profiller kullanılarak analiz tekrar gerçekleştirilerek düğüm noktalarının konumlarındaki değişimler gözlemlenmiştir.

DİKDÖRTGEN PROFİL



Kesit olarak bir kenarı 10 cm olan kare seçilmiştir.

Her Bir Düğümün Yer Değiştirmesi

PRINT U NODAL SOLUTION PER NODE

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1

TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

NODE	UX	UY	UZ	USUM
1	0.0000	0.0000	0.0000	0.0000
2	0.81852E-004	-0.19591E-004	0.0000	0.84164E-004
3	0.18173E-005	-0.19591E-005	0.0000	0.26722E-005
4	0.68925E-005	-0.39182E-005	0.0000	0.79283E-005
5	0.14534E-004	-0.58773E-005	0.0000	0.15678E-004
6	0.24052E-004	-0.78365E-005	0.0000	0.25297E-004
7	0.34755E-004	-0.97956E-005	0.0000	0.36109E-004
8	0.45951E-004	-0.11755E-004	0.0000	0.47431E-004
9	0.56950E-004	-0.13714E-004	0.0000	0.58578E-004
10	0.67060E-004	-0.15673E-004	0.0000	0.68868E-004
11	0.75592E-004	-0.17632E-004	0.0000	0.77621E-004
12	0.75683E-004	-0.33693E-004	0.0000	0.82844E-004
13	0.21756E-005	-0.25581E-006	0.0000	0.21906E-005
14	0.74414E-005	-0.22957E-005	0.0000	0.77874E-005
15	0.15088E-004	-0.57102E-005	0.0000	0.16132E-004
16	0.24406E-004	-0.10090E-004	0.0000	0.26409E-004
17	0.34685E-004	-0.15024E-004	0.0000	0.37800E-004
18	0.45218E-004	-0.20105E-004	0.0000	0.49486E-004
19	0.55293E-004	-0.24922E-004	0.0000	0.60650E-004
20	0.64202E-004	-0.29065E-004	0.0000	0.70475E-004

21	0.71235E-004-0.32125E-004	0.0000	0.78144E-004
22	0.76591E-004-0.31992E-004	0.0000	0.83004E-004
23	0.77235E-004-0.30555E-004	0.0000	0.83059E-004
24	0.77690E-004-0.29307E-004	0.0000	0.83034E-004
25	0.78030E-004-0.28173E-004	0.0000	0.82960E-004
26	0.78331E-004-0.27079E-004	0.0000	0.82880E-004
27	0.78667E-004-0.25950E-004	0.0000	0.82836E-004
28	0.79112E-004-0.24711E-004	0.0000	0.82882E-004
29	0.79742E-004-0.23288E-004	0.0000	0.83073E-004
30	0.80630E-004-0.21606E-004	0.0000	0.83475E-004
31	0.76245E-004-0.31608E-004	0.0000	0.82537E-004
32	0.81292E-004-0.22986E-004	0.0000	0.84479E-004
33	0.80731E-004-0.25933E-004	0.0000	0.84794E-004
34	0.80170E-004-0.28418E-004	0.0000	0.85058E-004
35	0.79609E-004-0.30425E-004	0.0000	0.85225E-004
36	0.79049E-004-0.31940E-004	0.0000	0.85258E-004
37	0.78488E-004-0.32948E-004	0.0000	0.85123E-004

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1

TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

NODE	UX	UY	UZ	USUM
38	0.77927E-004-0.33434E-004	0.0000	0.84797E-004	
39	0.77367E-004-0.33382E-004	0.0000	0.84261E-004	
40	0.76806E-004-0.32778E-004	0.0000	0.83508E-004	
41	0.76854E-004-0.32482E-004	0.0000	0.83437E-004	
42	0.77457E-004-0.33349E-004	0.0000	0.84332E-004	
43	0.78001E-004-0.34158E-004	0.0000	0.85152E-004	

44	0.78432E-004-0.34854E-004	0.0000	0.85828E-004
45	0.78698E-004-0.35384E-004	0.0000	0.86287E-004
46	0.78745E-004-0.35696E-004	0.0000	0.86458E-004
47	0.78520E-004-0.35736E-004	0.0000	0.86270E-004
48	0.77970E-004-0.35451E-004	0.0000	0.85651E-004
49	0.77042E-004-0.34788E-004	0.0000	0.84532E-004
50	0.83618E-004-0.19174E-004	0.0000	0.85788E-004
51	0.76477E-004-0.35875E-004	0.0000	0.84473E-004
52	0.77270E-004-0.36808E-004	0.0000	0.85589E-004
53	0.78064E-004-0.36659E-004	0.0000	0.86243E-004
54	0.78857E-004-0.35591E-004	0.0000	0.86517E-004
55	0.79651E-004-0.33771E-004	0.0000	0.86514E-004
56	0.80444E-004-0.31364E-004	0.0000	0.86342E-004
57	0.81238E-004-0.28536E-004	0.0000	0.86104E-004
58	0.82031E-004-0.25451E-004	0.0000	0.85889E-004
59	0.82825E-004-0.22275E-004	0.0000	0.85768E-004
60	0.76710E-004-0.30624E-004	0.0000	0.82597E-004
61	0.77194E-004-0.29623E-004	0.0000	0.82683E-004
62	0.77713E-004-0.28589E-004	0.0000	0.82805E-004
63	0.78281E-004-0.27507E-004	0.0000	0.82973E-004
64	0.78915E-004-0.26363E-004	0.0000	0.83202E-004
65	0.79631E-004-0.25140E-004	0.0000	0.83505E-004
66	0.80443E-004-0.23825E-004	0.0000	0.83897E-004
67	0.81368E-004-0.22403E-004	0.0000	0.84395E-004
68	0.82421E-004-0.20857E-004	0.0000	0.85019E-004
69	0.76391E-004-0.55238E-005	0.0000	0.76590E-004
70	0.82507E-004-0.17403E-004	0.0000	0.84322E-004
71	0.81617E-004-0.15864E-004	0.0000	0.83145E-004
72	0.80899E-004-0.14504E-004	0.0000	0.82189E-004
73	0.80302E-004-0.13270E-004	0.0000	0.81391E-004
74	0.79773E-004-0.12107E-004	0.0000	0.80687E-004

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1

TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

NODE	UX	UY	UZ	USUM
75	0.79263E-004	-0.10965E-004	0.0000	0.80018E-004
76	0.78721E-004	-0.97880E-005	0.0000	0.79327E-004
77	0.78096E-004	-0.85244E-005	0.0000	0.78560E-004
78	0.77336E-004	-0.71207E-005	0.0000	0.77663E-004
79	0.76376E-004	-0.83195E-005	0.0000	0.76828E-004
80	0.76362E-004	-0.11242E-004	0.0000	0.77185E-004
81	0.76347E-004	-0.14227E-004	0.0000	0.77661E-004
82	0.76333E-004	-0.17213E-004	0.0000	0.78249E-004
83	0.76318E-004	-0.20136E-004	0.0000	0.78930E-004
84	0.76303E-004	-0.22934E-004	0.0000	0.79675E-004
85	0.76289E-004	-0.25543E-004	0.0000	0.80451E-004
86	0.76274E-004	-0.27900E-004	0.0000	0.81217E-004
87	0.76260E-004	-0.29943E-004	0.0000	0.81927E-004
88	0.11540E-003	0.0000	0.0000	0.11540E-003
89	0.86662E-004	-0.17337E-004	0.0000	0.88379E-004
90	0.90330E-004	-0.15125E-004	0.0000	0.91587E-004
91	0.94398E-004	-0.12671E-004	0.0000	0.95245E-004
92	0.98645E-004	-0.10109E-004	0.0000	0.99162E-004
93	0.10285E-003	-0.75750E-005	0.0000	0.10313E-003
94	0.10678E-003	-0.52014E-005	0.0000	0.10691E-003
95	0.11023E-003	-0.31230E-005	0.0000	0.11027E-003
96	0.11296E-003	-0.14739E-005	0.0000	0.11297E-003
97	0.11476E-003	-0.38815E-006	0.0000	0.11476E-003
98	0.11465E-003	-0.55238E-006	0.0000	0.11465E-003

99	0.11254E-003-0.11048E-005	0.0000	0.11255E-003
100	0.10932E-003-0.16571E-005	0.0000	0.10933E-003
101	0.10523E-003-0.22095E-005	0.0000	0.10526E-003
102	0.10053E-003-0.27619E-005	0.0000	0.10057E-003
103	0.95454E-004-0.33143E-005	0.0000	0.95512E-004
104	0.90255E-004-0.38667E-005	0.0000	0.90338E-004
105	0.85180E-004-0.44190E-005	0.0000	0.85295E-004
106	0.80476E-004-0.49714E-005	0.0000	0.80630E-004

MAXIMUM ABSOLUTE VALUES

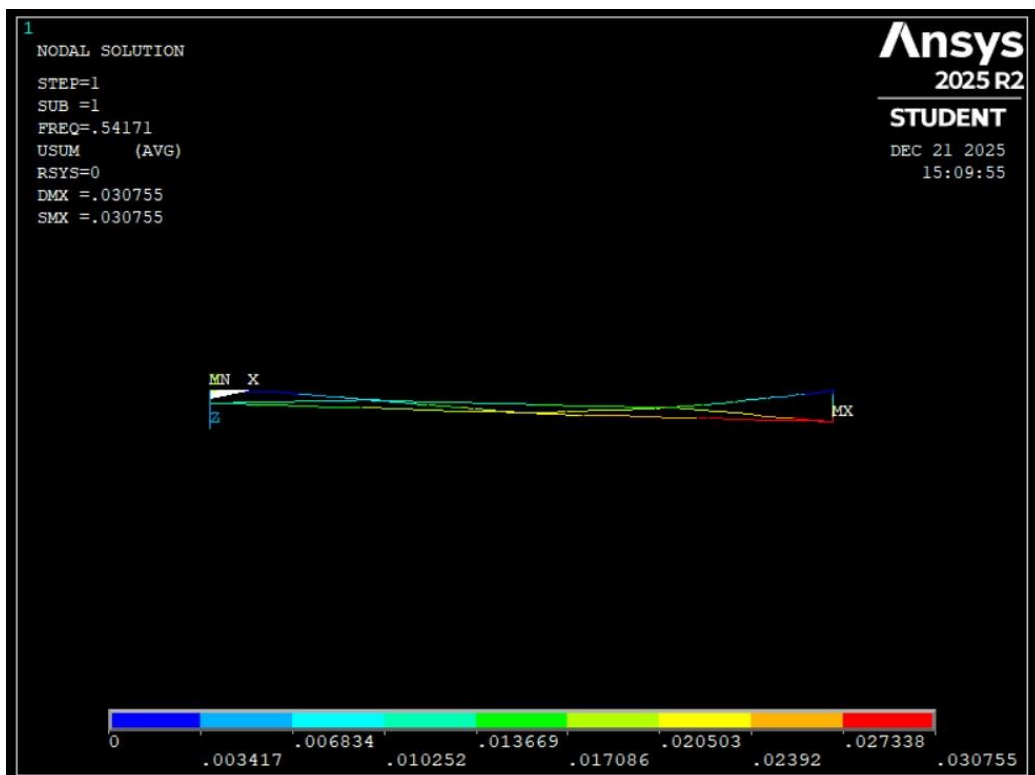
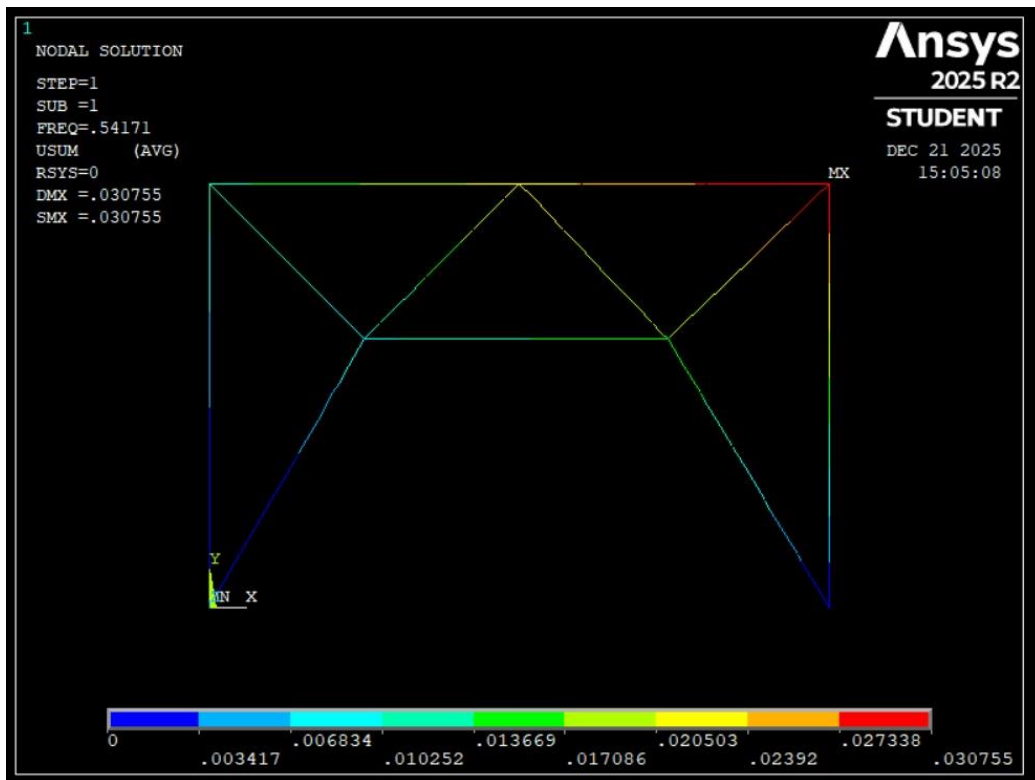
NODE	88	52	0	88
VALUE	0.11540E-003-0.36808E-004	0.0000	0.11540E-003	

FREKANAS ANALİZİ

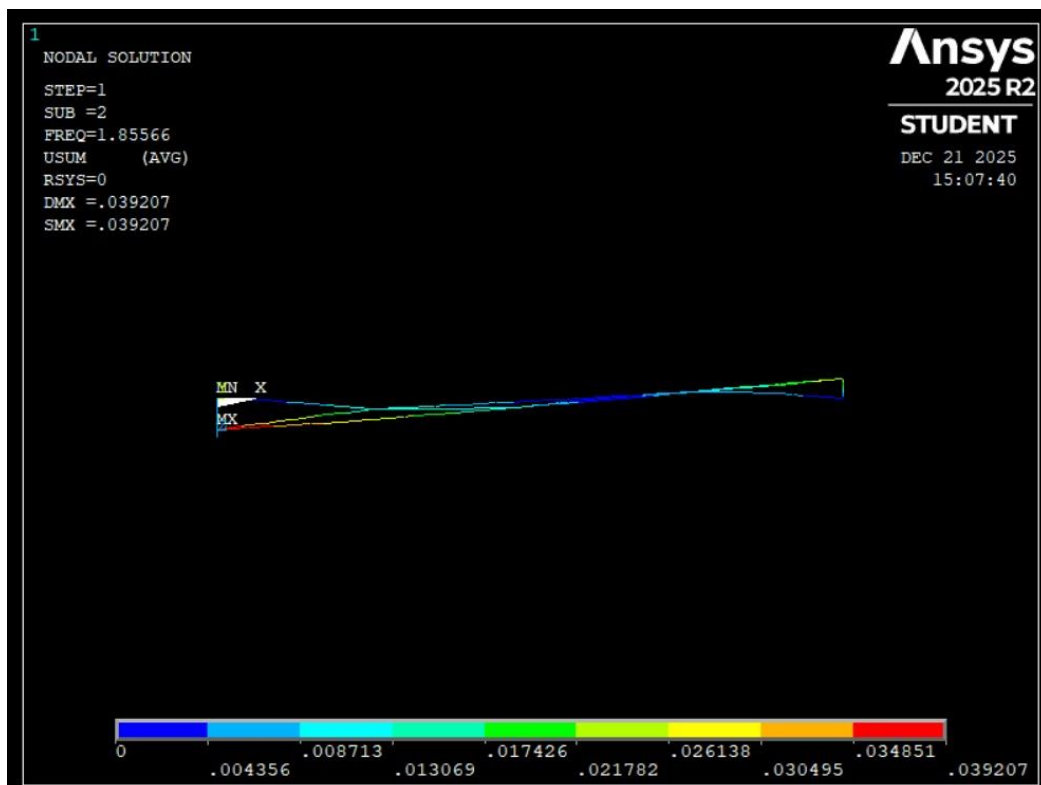
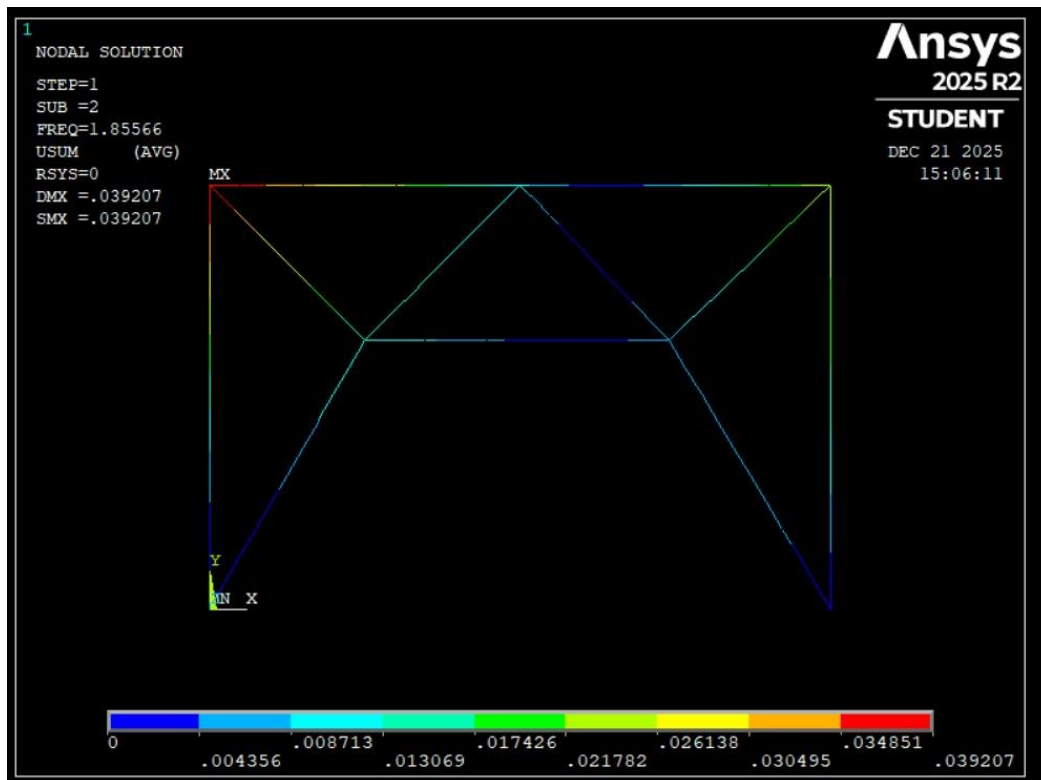
***** INDEX OF DATA SETS ON RESULTS FILE *****

SET	TIME/FREQ	LOAD	STEP	SUBSTEP	CUMULATIVE
1	0.54170970	1	1	1	
2	1.8556646	1	2	2	
3	4.4967949	1	3	3	
4	5.9074177	1	4	4	
5	8.4878824	1	5	5	
6	9.9834251	1	6	6	
7	10.599779	1	7	7	
8	11.726148	1	8	8	
9	12.295391	1	9	9	
10	15.772406	1	10	10	

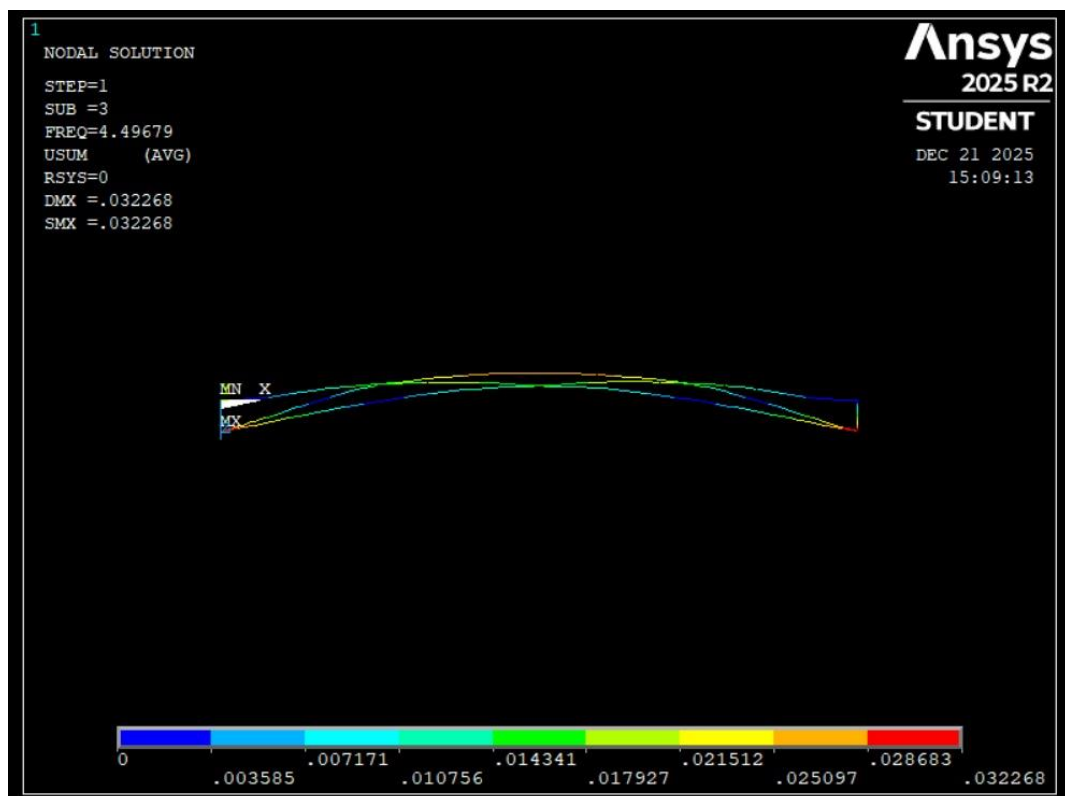
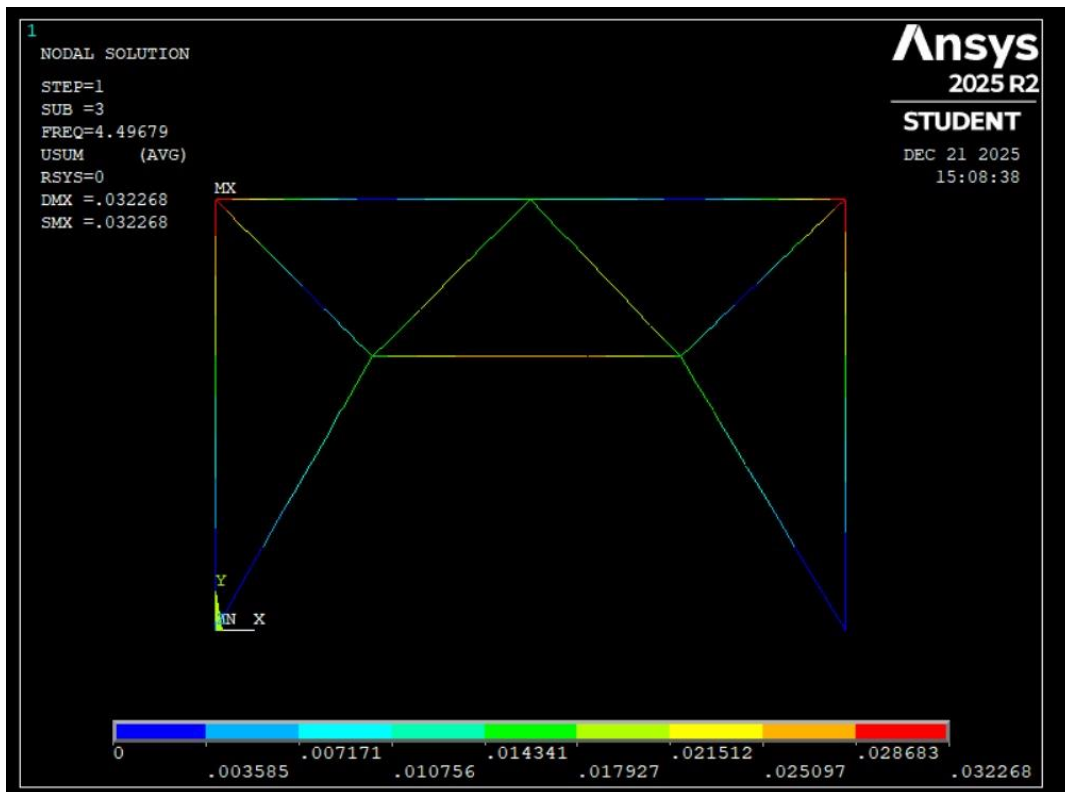
Mod1



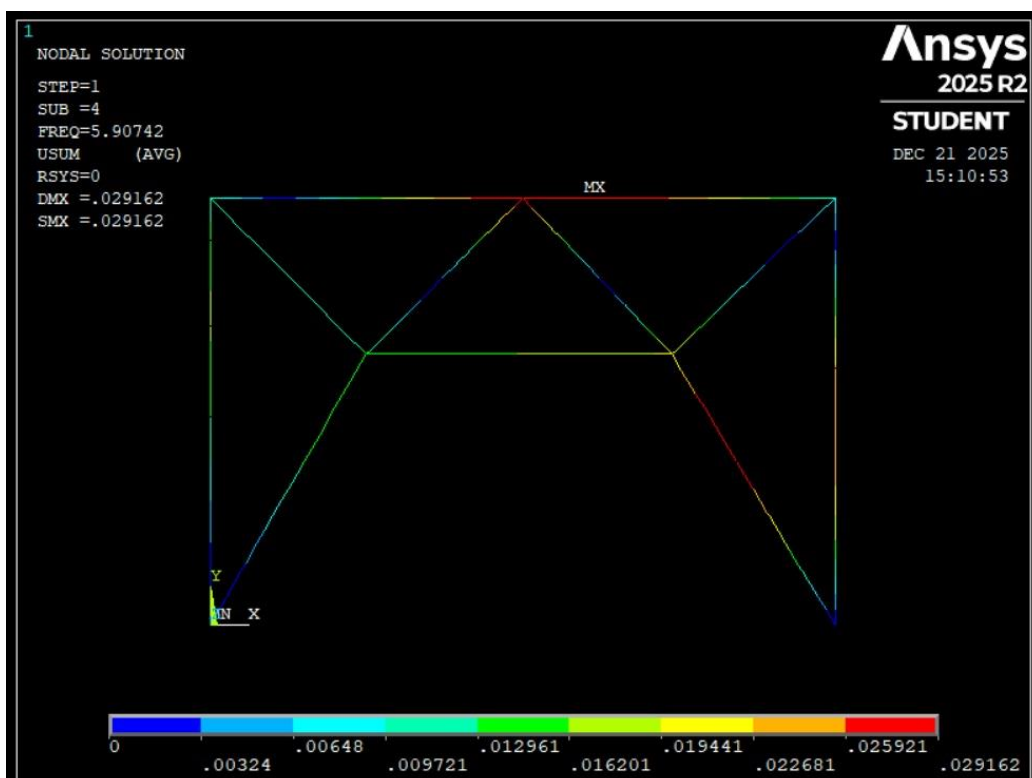
Mod 2



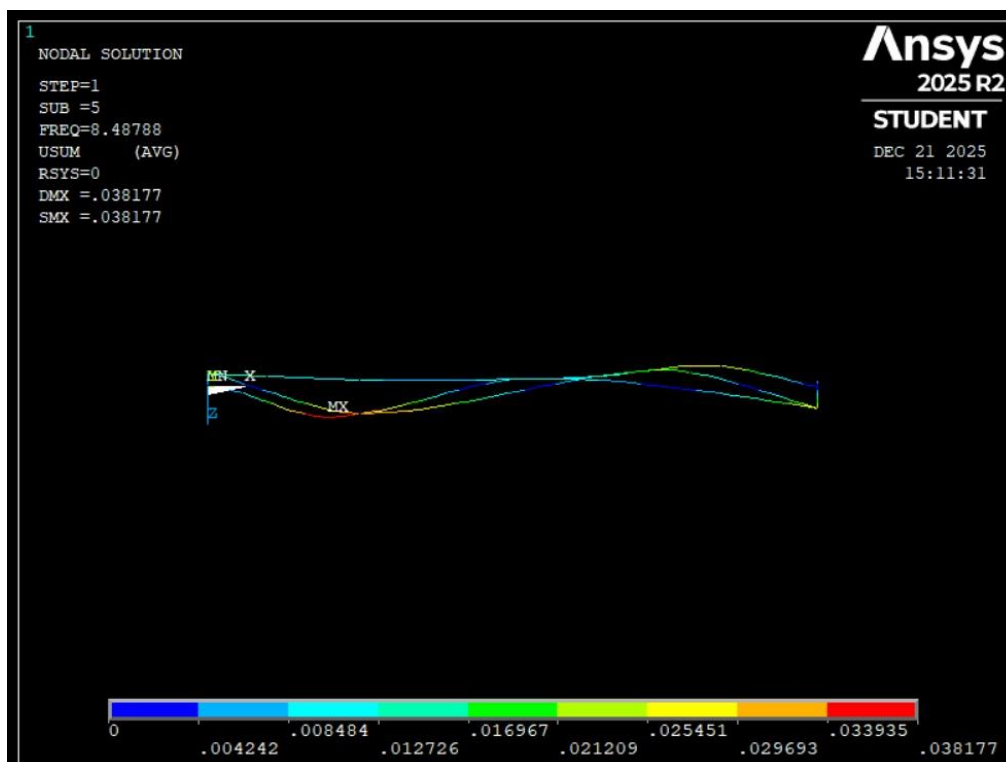
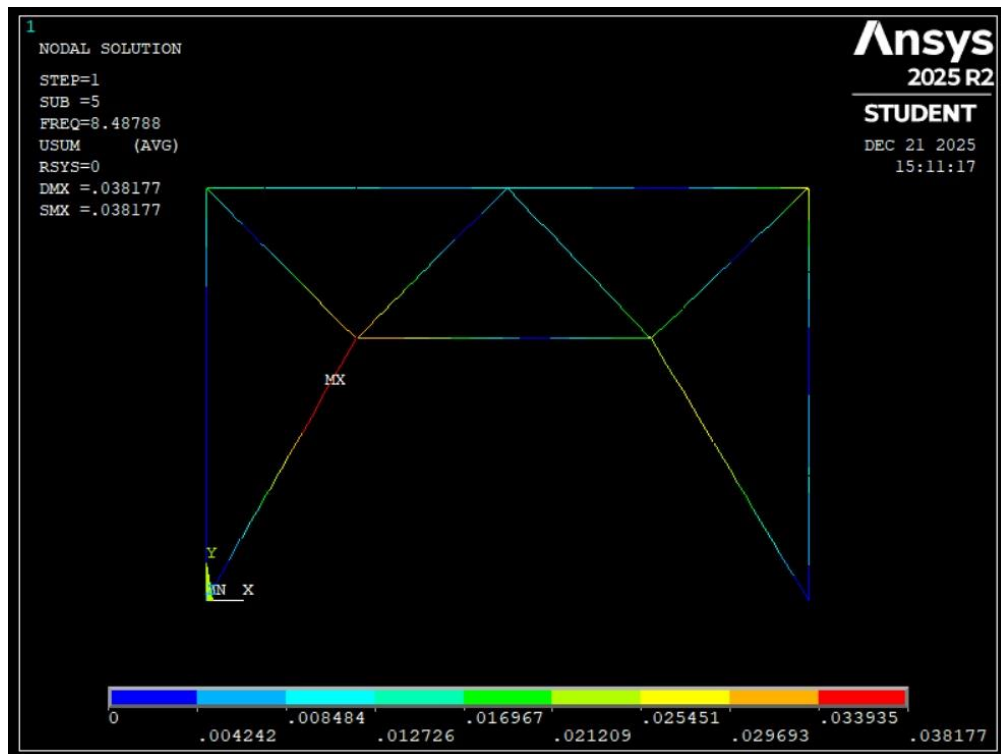
Mod 3



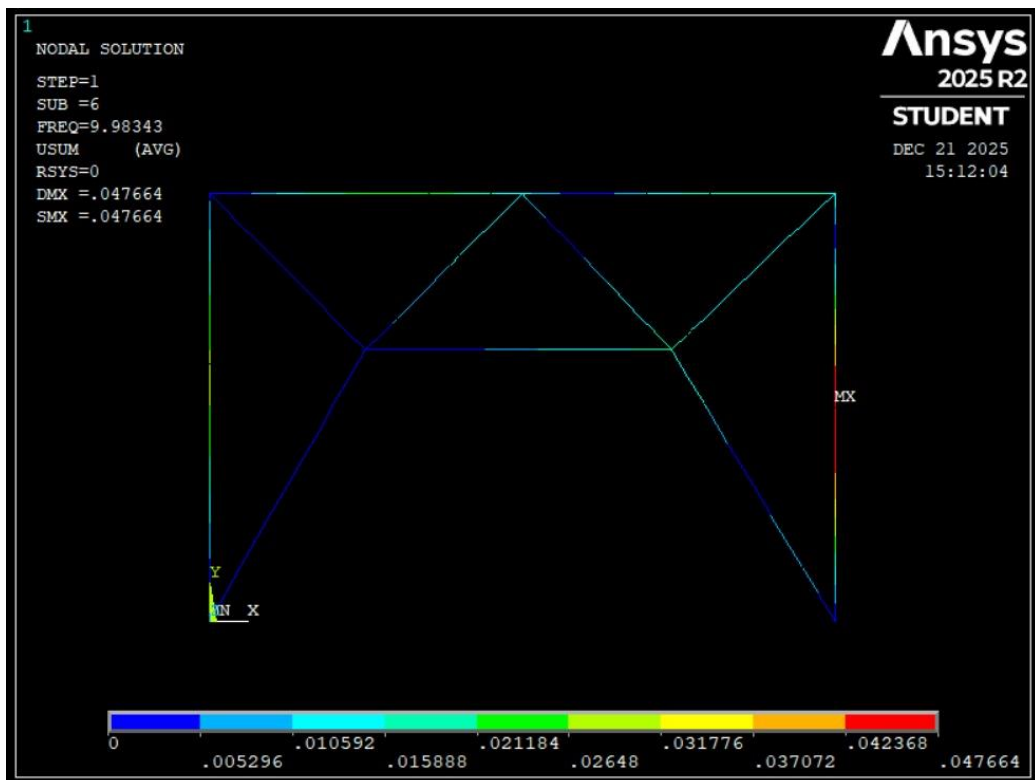
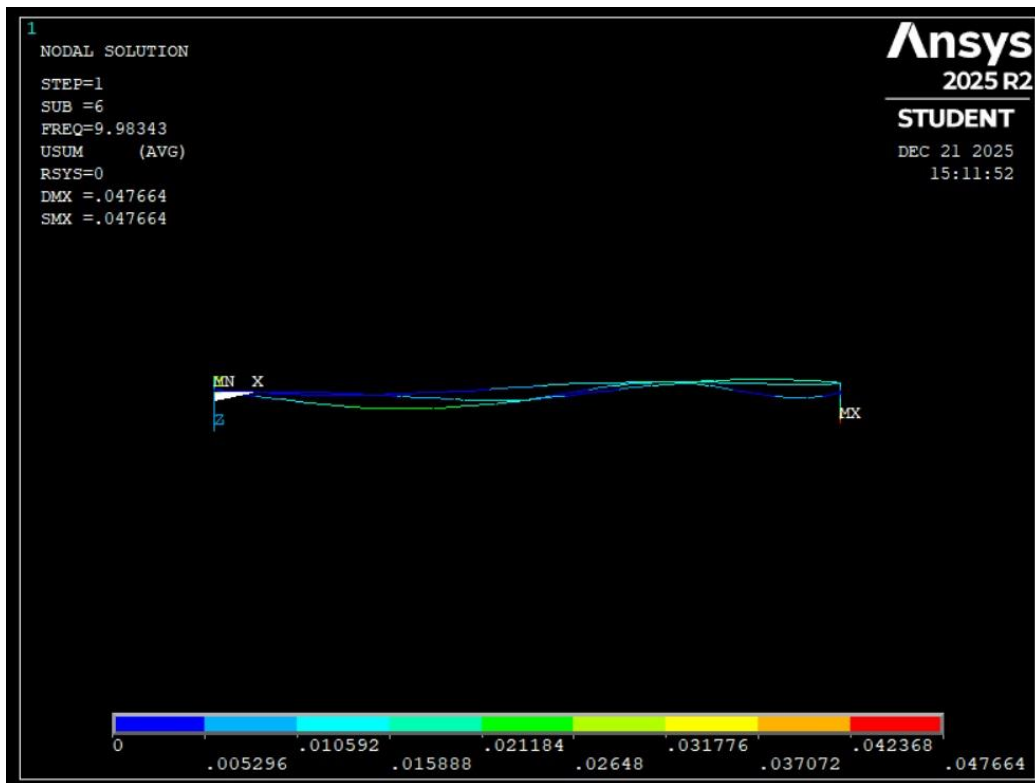
Mod 4



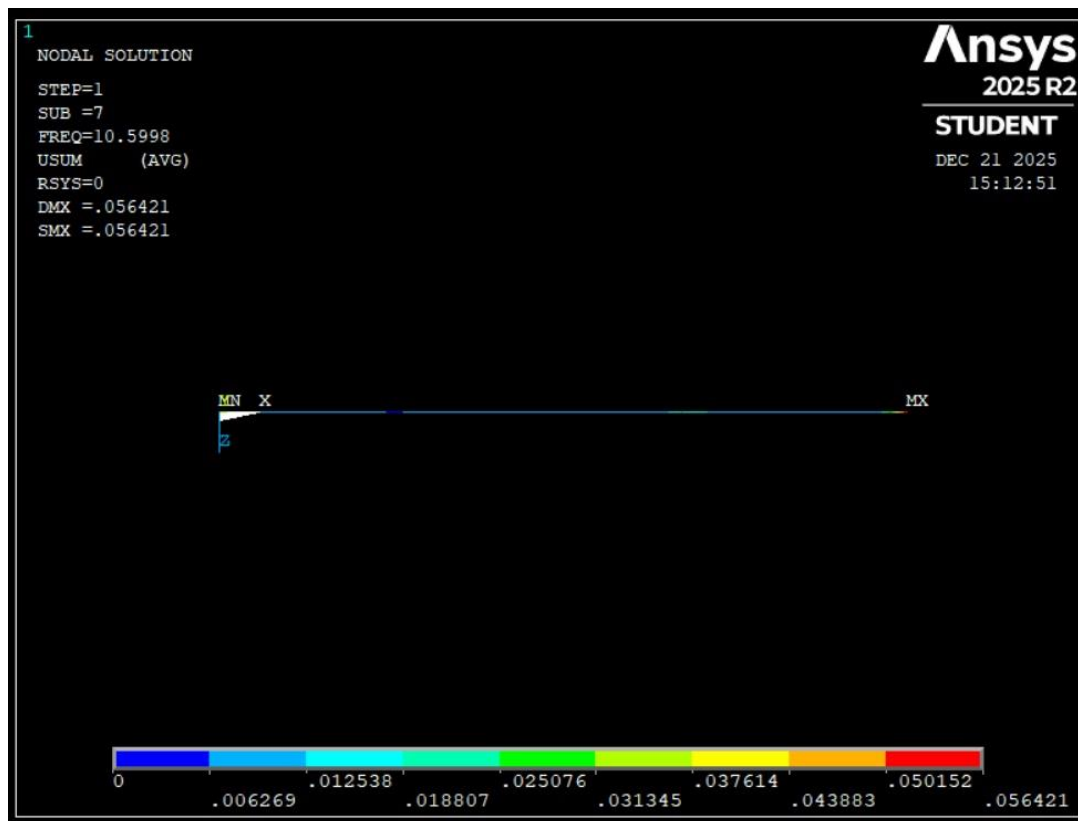
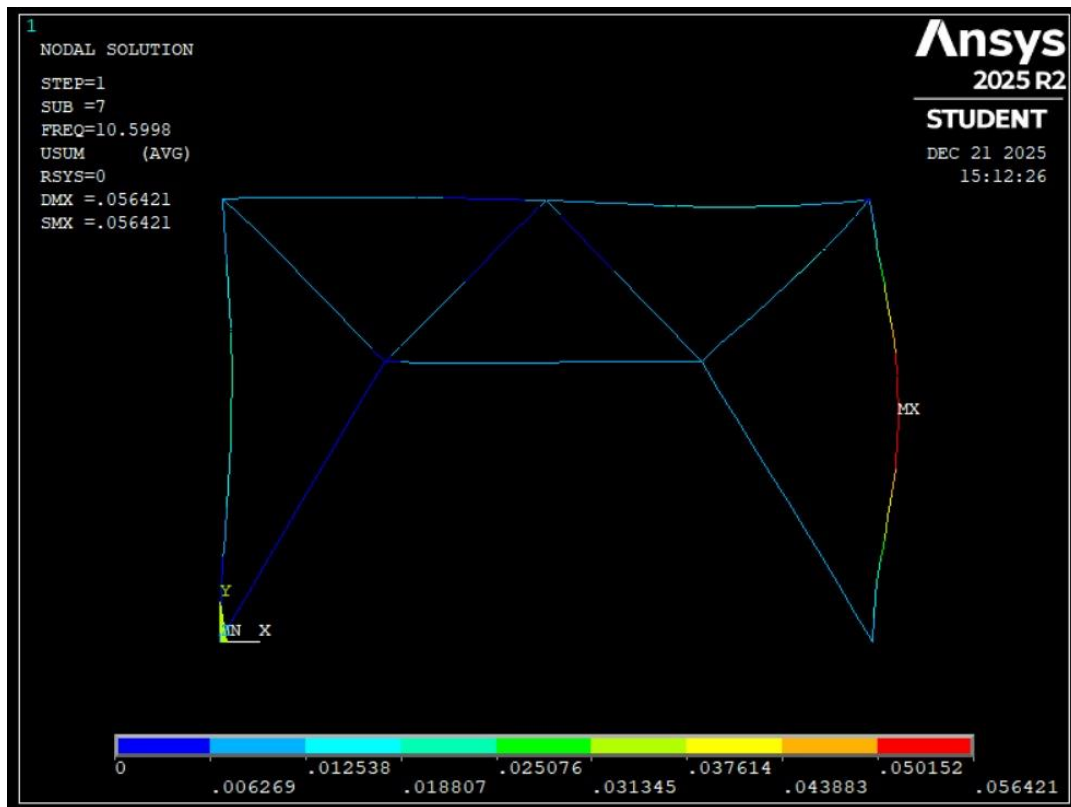
Mod 5



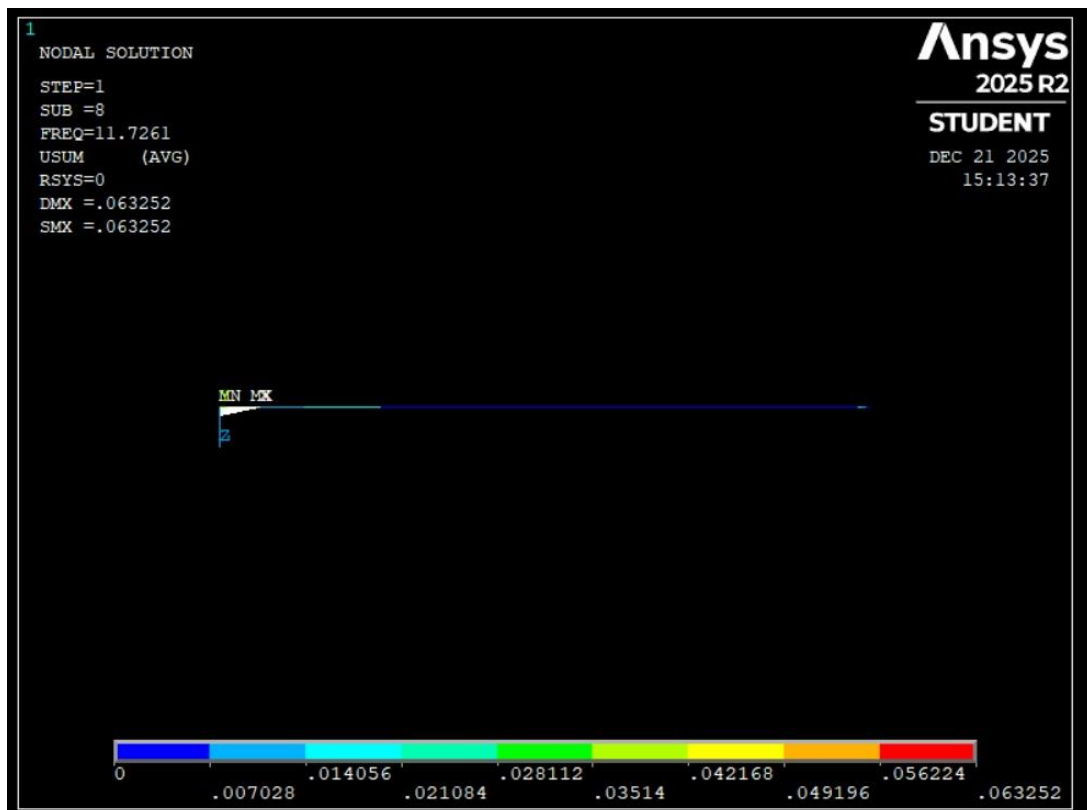
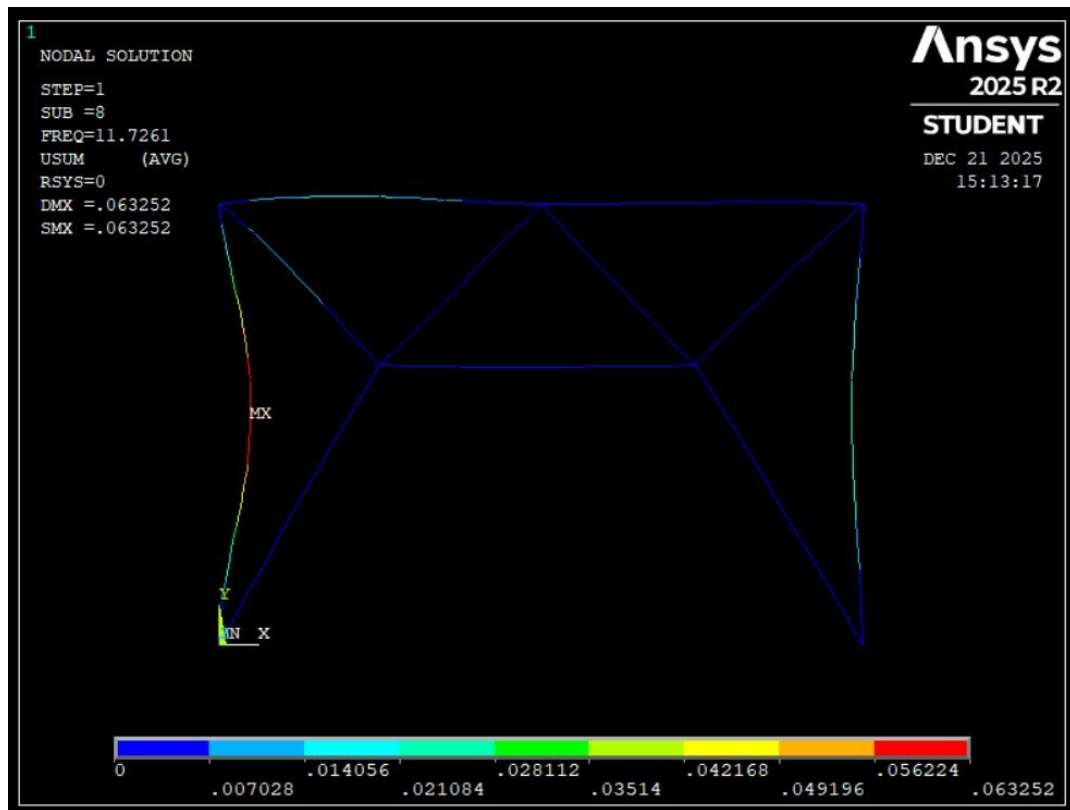
Mod 6



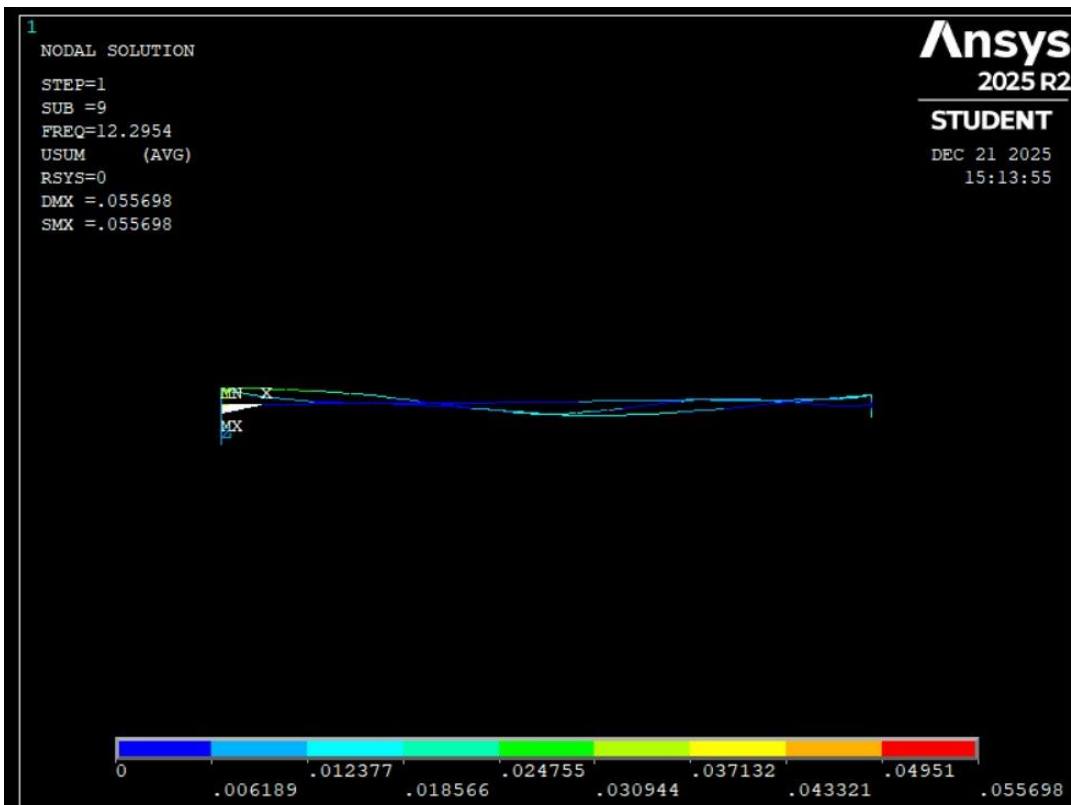
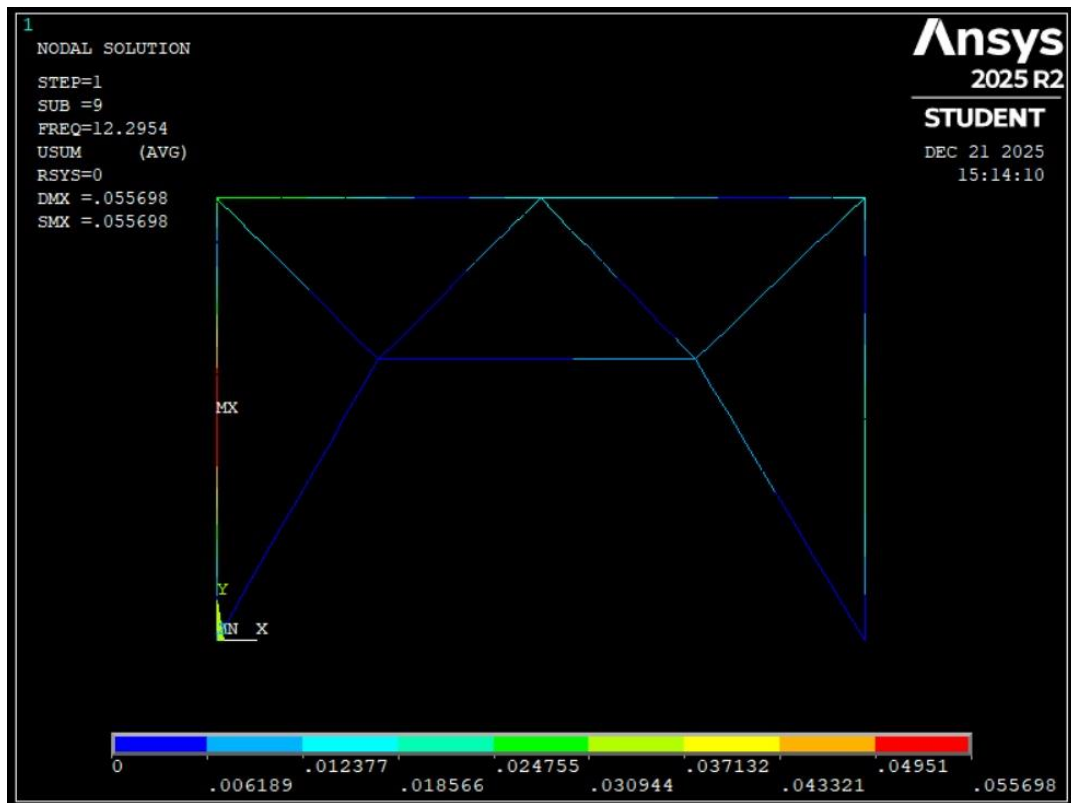
Mod 7



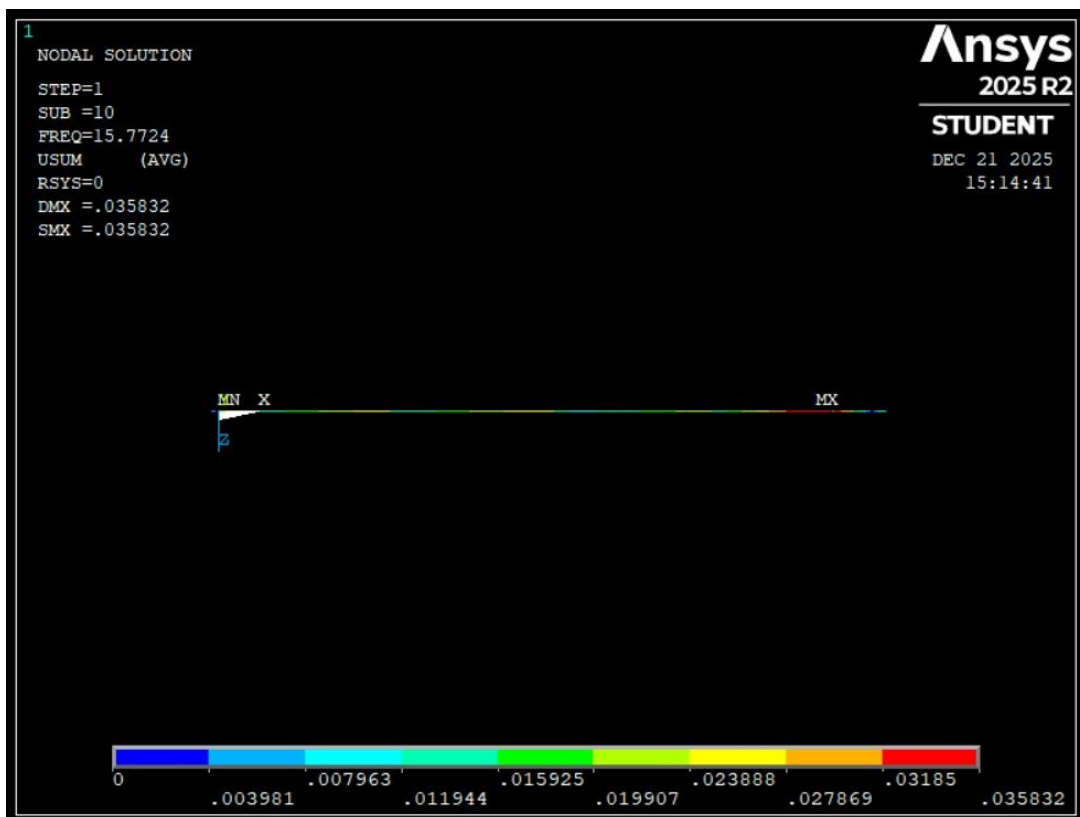
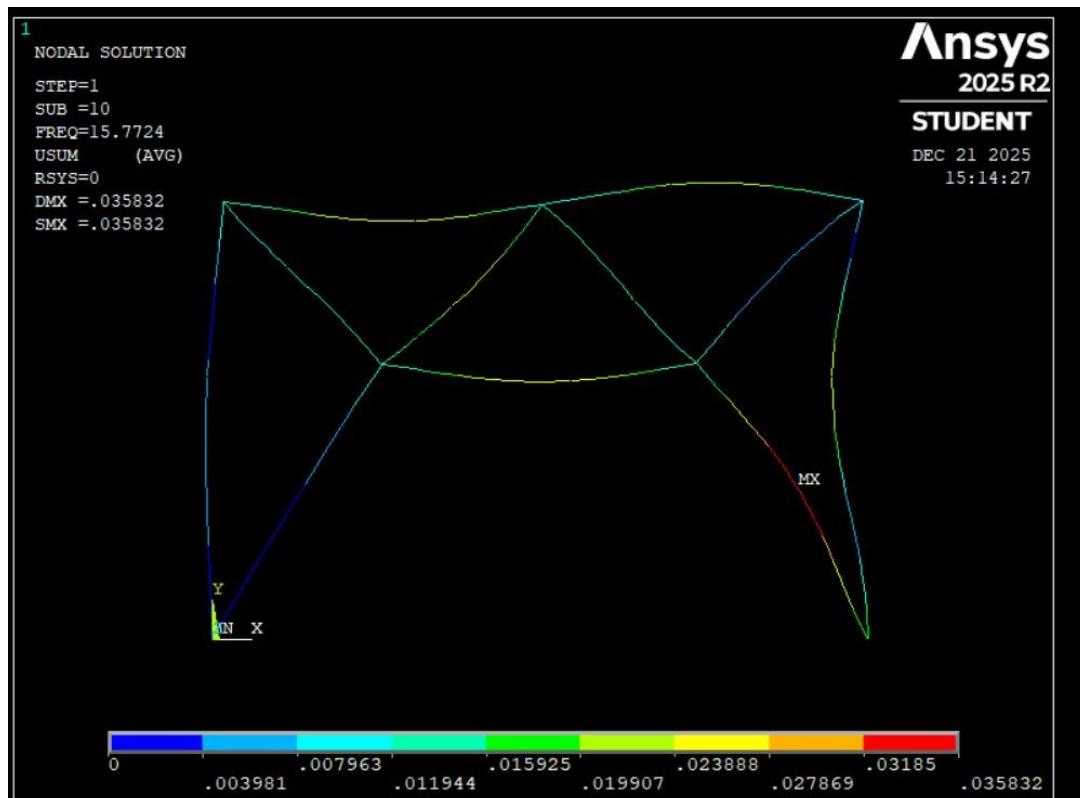
Mod 8



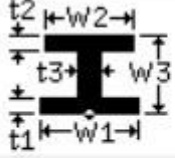
Mod 9



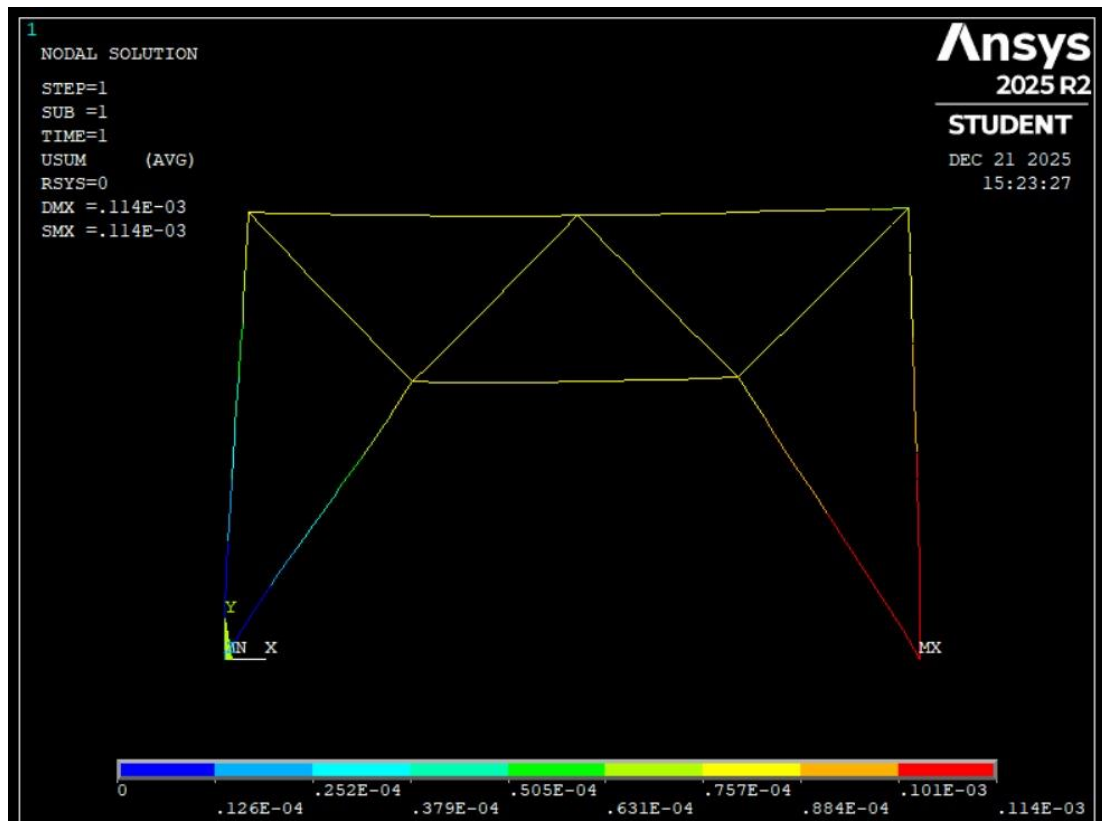
Mod 10



I - PROFİL



W1	0.2
W2	0.2
W3	0.3
t1	0.018
t2	0.018
t3	0.0106



Her Bir Düğümün Yer Değiştirmesi

PRINT U NODAL SOLUTION PER NODE

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1

TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

NODE	UX	UY	UZ	USUM
1	0.0000	0.0000	0.0000	0.0000
2	0.80621E-004	-0.19407E-004	-0.12782E-015	0.82924E-004
3	0.18025E-005	-0.19407E-005	-0.17726E-017	0.26487E-005
4	0.68073E-005	-0.38814E-005	-0.67306E-017	0.78361E-005
5	0.14335E-004	-0.58221E-005	-0.14597E-016	0.15472E-004
6	0.23707E-004	-0.77628E-005	-0.25095E-016	0.24945E-004
7	0.34243E-004	-0.97035E-005	-0.37946E-016	0.35591E-004
8	0.45264E-004	-0.11644E-004	-0.52875E-016	0.46738E-004
9	0.56092E-004	-0.13585E-004	-0.69604E-016	0.57714E-004
10	0.66047E-004	-0.15526E-004	-0.87856E-016	0.67847E-004
11	0.74450E-004	-0.17466E-004	-0.10735E-015	0.76471E-004
12	0.74574E-004	-0.33214E-004	-0.55146E-016	0.81636E-004
13	0.21637E-005	-0.26508E-006	-0.55883E-018	0.21799E-005
14	0.73594E-005	-0.22807E-005	-0.21813E-017	0.77047E-005
15	0.14891E-004	-0.56452E-005	-0.48548E-017	0.15925E-004
16	0.24064E-004	-0.99567E-005	-0.85807E-017	0.26042E-004
17	0.34180E-004	-0.14813E-004	-0.13377E-016	0.37252E-004
18	0.44545E-004	-0.19814E-004	-0.19279E-016	0.48753E-004
19	0.54463E-004	-0.24556E-004	-0.26338E-016	0.59743E-004

20 0.63238E-004-0.28637E-004-0.34624E-016 0.69420E-004
 21 0.70173E-004-0.31658E-004-0.44217E-016 0.76984E-004
 22 0.75464E-004-0.31547E-004-0.62420E-016 0.81793E-004
 23 0.76096E-004-0.30140E-004-0.69630E-016 0.81848E-004
 24 0.76542E-004-0.28918E-004-0.76799E-016 0.81822E-004
 25 0.76876E-004-0.27808E-004-0.83951E-016 0.81751E-004
 26 0.77170E-004-0.26738E-004-0.91109E-016 0.81671E-004
 27 0.77499E-004-0.25633E-004-0.98297E-016 0.81628E-004
 28 0.77935E-004-0.24421E-004-0.10554E-015 0.81671E-004
 29 0.78552E-004-0.23028E-004-0.11286E-015 0.81857E-004
 30 0.79422E-004-0.21381E-004-0.12028E-015 0.82250E-004
 31 0.75140E-004-0.31185E-004-0.13185E-015 0.81354E-004
 32 0.80073E-004-0.22744E-004-0.12787E-015 0.83240E-004
 33 0.79525E-004-0.25641E-004-0.12812E-015 0.83556E-004
 34 0.78976E-004-0.28081E-004-0.12851E-015 0.83820E-004
 35 0.78428E-004-0.30051E-004-0.12901E-015 0.83989E-004
 36 0.77880E-004-0.31537E-004-0.12957E-015 0.84023E-004
 37 0.77332E-004-0.32523E-004-0.13015E-015 0.83893E-004

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1
 TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE SYSTEM

NODE	UX	UY	UZ	USUM
38	0.76784E-004	-0.32996E-004	-0.13071E-015	0.83574E-004
39	0.76236E-004	-0.32940E-004	-0.13121E-015	0.83048E-004
40	0.75688E-004	-0.32341E-004	-0.13160E-015	0.82308E-004
41	0.75744E-004	-0.32049E-004	-0.12311E-015	0.82245E-004
42	0.76339E-004	-0.32903E-004	-0.11461E-015	0.83127E-004

43 0.76872E-004-0.33696E-004-0.10635E-015 0.83933E-004
44 0.77293E-004-0.34376E-004-0.98332E-016 0.84593E-004
45 0.77550E-004-0.34893E-004-0.90547E-016 0.85039E-004
46 0.77592E-004-0.35194E-004-0.82999E-016 0.85200E-004
47 0.77367E-004-0.35228E-004-0.75685E-016 0.85009E-004
48 0.76823E-004-0.34944E-004-0.68606E-016 0.84397E-004
49 0.75909E-004-0.34290E-004-0.61760E-016 0.83294E-004
50 0.82432E-004-0.18866E-004-0.63189E-016 0.84563E-004
51 0.75360E-004-0.35355E-004-0.54681E-016 0.83241E-004
52 0.76145E-004-0.36269E-004-0.54749E-016 0.84342E-004
53 0.76931E-004-0.36116E-004-0.55258E-016 0.84987E-004
54 0.77717E-004-0.35060E-004-0.56112E-016 0.85259E-004
55 0.78503E-004-0.33264E-004-0.57216E-016 0.85260E-004
56 0.79289E-004-0.30890E-004-0.58477E-016 0.85093E-004
57 0.80074E-004-0.28101E-004-0.59799E-016 0.84862E-004
58 0.80860E-004-0.25059E-004-0.61088E-016 0.84654E-004
59 0.81646E-004-0.21926E-004-0.62250E-016 0.84539E-004
60 0.75598E-004-0.30213E-004-0.12333E-015 0.81412E-004
61 0.76077E-004-0.29220E-004-0.11519E-015 0.81495E-004
62 0.76591E-004-0.28193E-004-0.10743E-015 0.81616E-004
63 0.77157E-004-0.27118E-004-0.10005E-015 0.81784E-004
64 0.77787E-004-0.25981E-004-0.93030E-016 0.82011E-004
65 0.78497E-004-0.24767E-004-0.86371E-016 0.82312E-004
66 0.79302E-004-0.23463E-004-0.80064E-016 0.82700E-004
67 0.80216E-004-0.22054E-004-0.74103E-016 0.83193E-004
68 0.81255E-004-0.20527E-004-0.68480E-016 0.83807E-004
69 0.75341E-004-0.54413E-005-0.10948E-015 0.75537E-004
70 0.81341E-004-0.17125E-004-0.68979E-016 0.83124E-004
71 0.80468E-004-0.15612E-004-0.74539E-016 0.81968E-004
72 0.79763E-004-0.14274E-004-0.79860E-016 0.81030E-004
73 0.79176E-004-0.13059E-004-0.84929E-016 0.80246E-004
74 0.78657E-004-0.11915E-004-0.89737E-016 0.79555E-004

***** POST1 NODAL DEGREE OF FREEDOM LISTING *****

LOAD STEP= 1 SUBSTEP= 1
TIME= 1.0000 LOAD CASE= 0

THE FOLLOWING DEGREE OF FREEDOM RESULTS ARE IN THE GLOBAL COORDINATE
SYSTEM

NODE	UX	UY	UZ	USUM
75	0.78157E-004	-0.10790E-004	-0.94273E-016	0.78898E-004
76	0.77625E-004	-0.96326E-005	-0.98526E-016	0.78221E-004
77	0.77012E-004	-0.83900E-005	-0.10249E-015	0.77467E-004
78	0.76267E-004	-0.70103E-005	-0.10614E-015	0.76589E-004
79	0.75321E-004	-0.81959E-005	-0.11411E-015	0.75765E-004
80	0.75301E-004	-0.11077E-004	-0.11816E-015	0.76111E-004
81	0.75281E-004	-0.14021E-004	-0.12164E-015	0.76575E-004
82	0.75261E-004	-0.16968E-004	-0.12459E-015	0.77150E-004
83	0.75240E-004	-0.19853E-004	-0.12700E-015	0.77816E-004
84	0.75220E-004	-0.22615E-004	-0.12892E-015	0.78547E-004
85	0.75200E-004	-0.25192E-004	-0.13034E-015	0.79308E-004
86	0.75180E-004	-0.27521E-004	-0.13129E-015	0.80059E-004
87	0.75160E-004	-0.29539E-004	-0.13179E-015	0.80756E-004
88	0.11362E-003	0.0000	0.0000	0.11362E-003
89	0.85431E-004	-0.17052E-004	-0.54540E-016	0.87116E-004
90	0.89036E-004	-0.14872E-004	-0.46666E-016	0.90269E-004
91	0.93029E-004	-0.12458E-004	-0.39472E-016	0.93860E-004
92	0.97194E-004	-0.99411E-005	-0.32861E-016	0.97701E-004
93	0.10131E-003	-0.74519E-005	-0.26734E-016	0.10159E-003
94	0.10517E-003	-0.51211E-005	-0.20997E-016	0.10529E-003
95	0.10854E-003	-0.30797E-005	-0.15552E-016	0.10859E-003
96	0.11122E-003	-0.14585E-005	-0.10302E-016	0.11123E-003
97	0.11298E-003	-0.38828E-006	-0.51500E-017	0.11299E-003

98 0.11288E-003-0.54413E-006-0.83220E-017 0.11288E-003
 99 0.11081E-003-0.10883E-005-0.16911E-016 0.11082E-003
 100 0.10766E-003-0.16324E-005-0.25885E-016 0.10767E-003
 101 0.10365E-003-0.21765E-005-0.35364E-016 0.10367E-003
 102 0.99040E-004-0.27207E-005-0.45466E-016 0.99078E-004
 103 0.94065E-004-0.32648E-005-0.56310E-016 0.94121E-004
 104 0.88966E-004-0.38089E-005-0.68014E-016 0.89047E-004
 105 0.83984E-004-0.43531E-005-0.80698E-016 0.84097E-004
 106 0.79362E-004-0.48972E-005-0.94480E-016 0.79513E-004

MAXIMUM ABSOLUTE VALUES

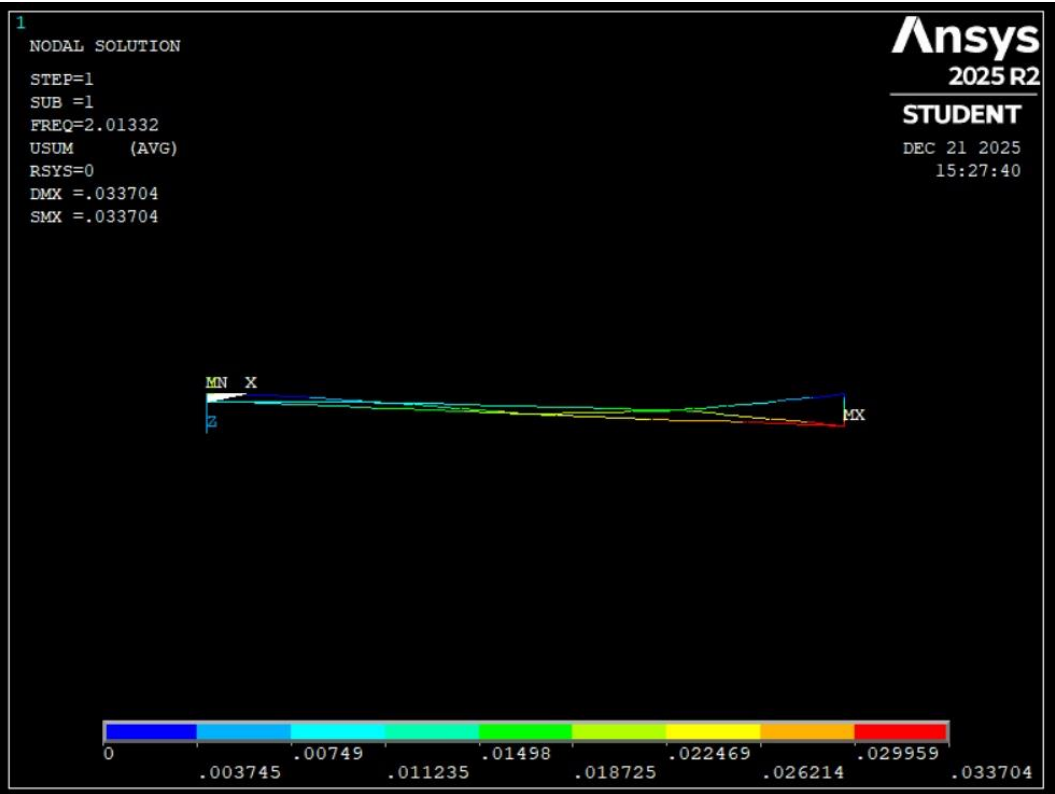
NODE 88 52 0 88
 VALUE 0.11362E-003-0.36269E-004 0.0000 0.11362E-003

***** INDEX OF DATA SETS ON RESULTS FILE *****

SET	TIME/FREQ	LOAD	STEP	SUBSTEP	CUMULATIVE
1	2.0133176	1	1	1	
2	6.4011984	1	2	2	
3	13.389396	1	3	3	
4	16.650172	1	4	4	
5	17.512046	1	5	5	
6	17.601096	1	6	6	
7	19.758586	1	7	7	
8	22.479311	1	8	8	
9	22.505788	1	9	9	
10	23.667080	1	10	10	

FREKANS ANALİZİ

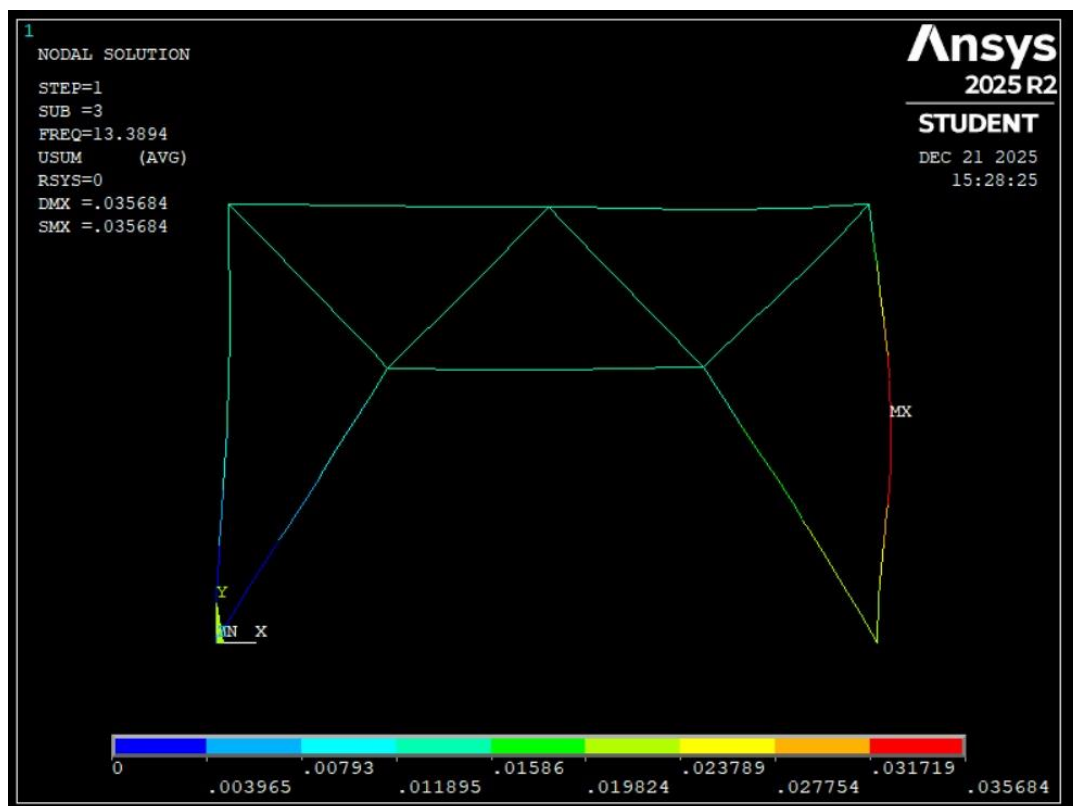
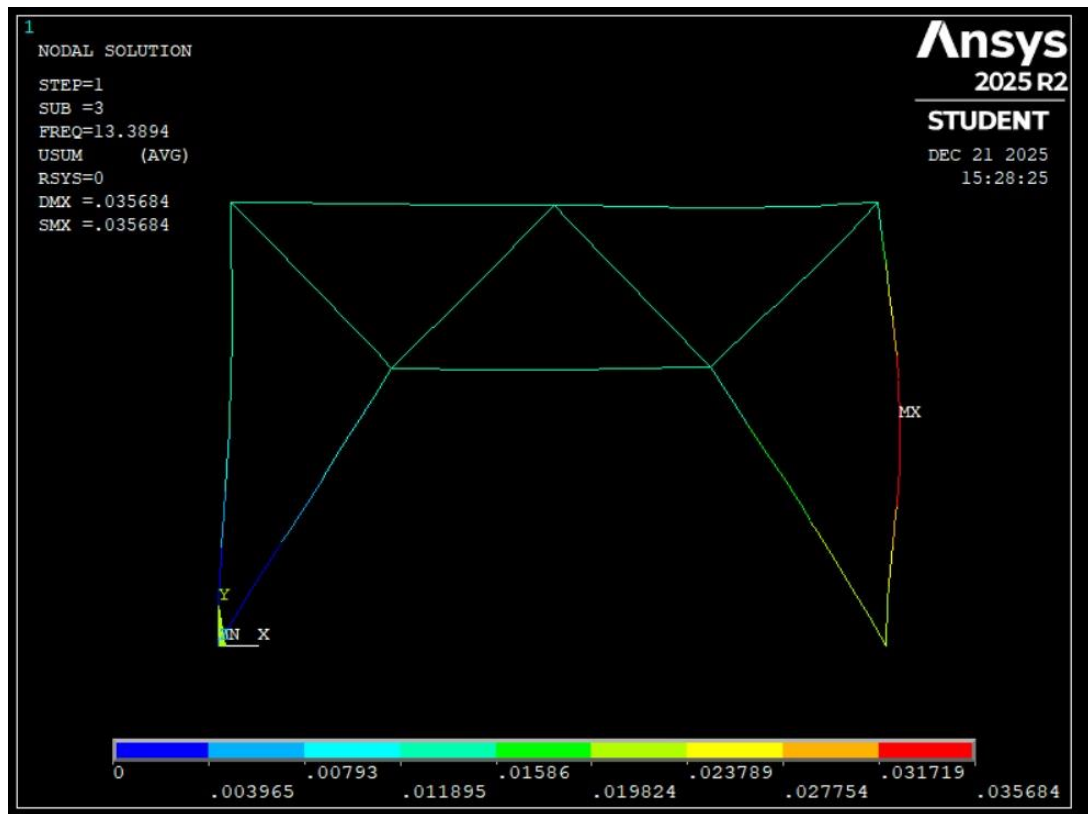
MOD 1



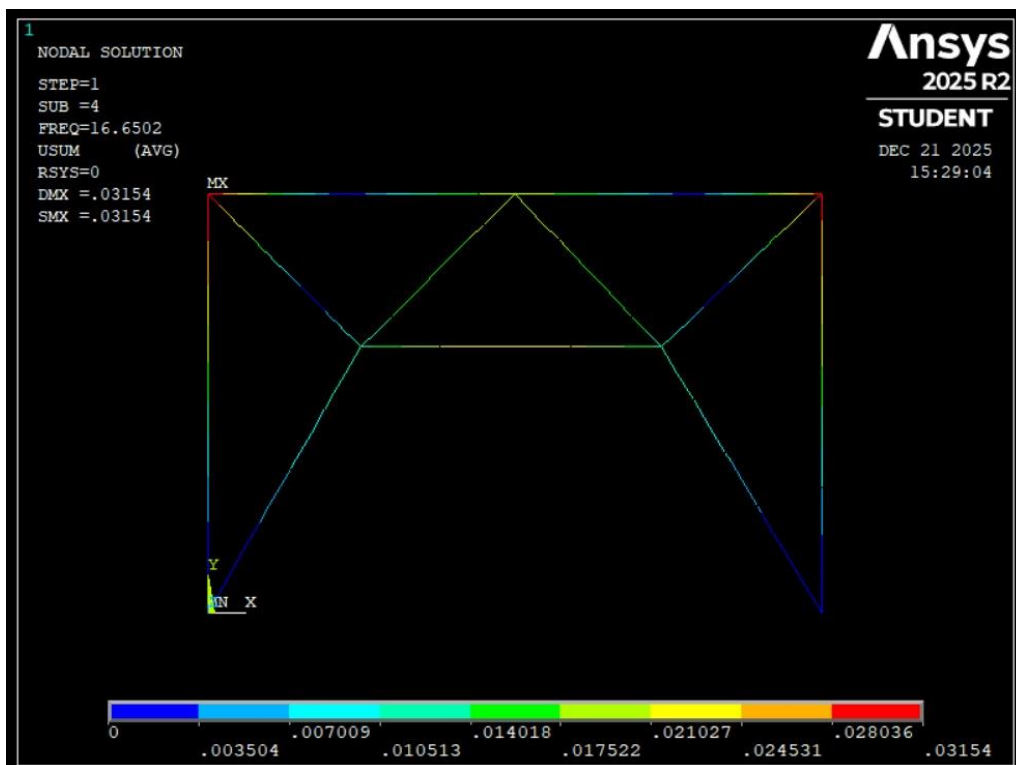
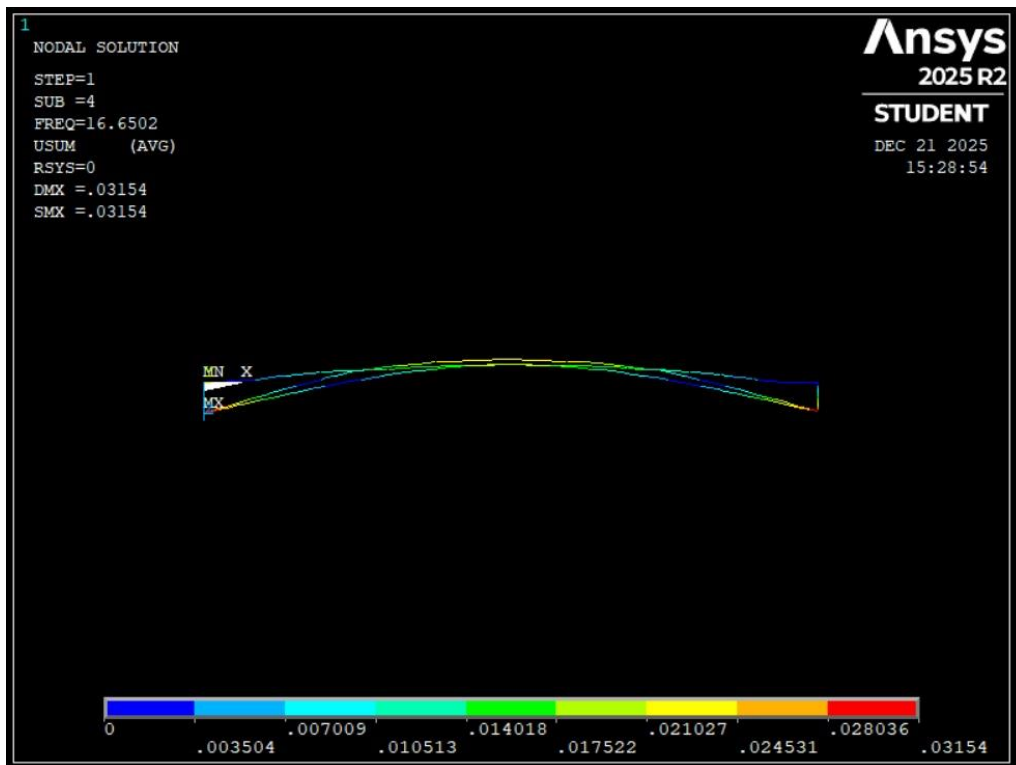
Mod 2



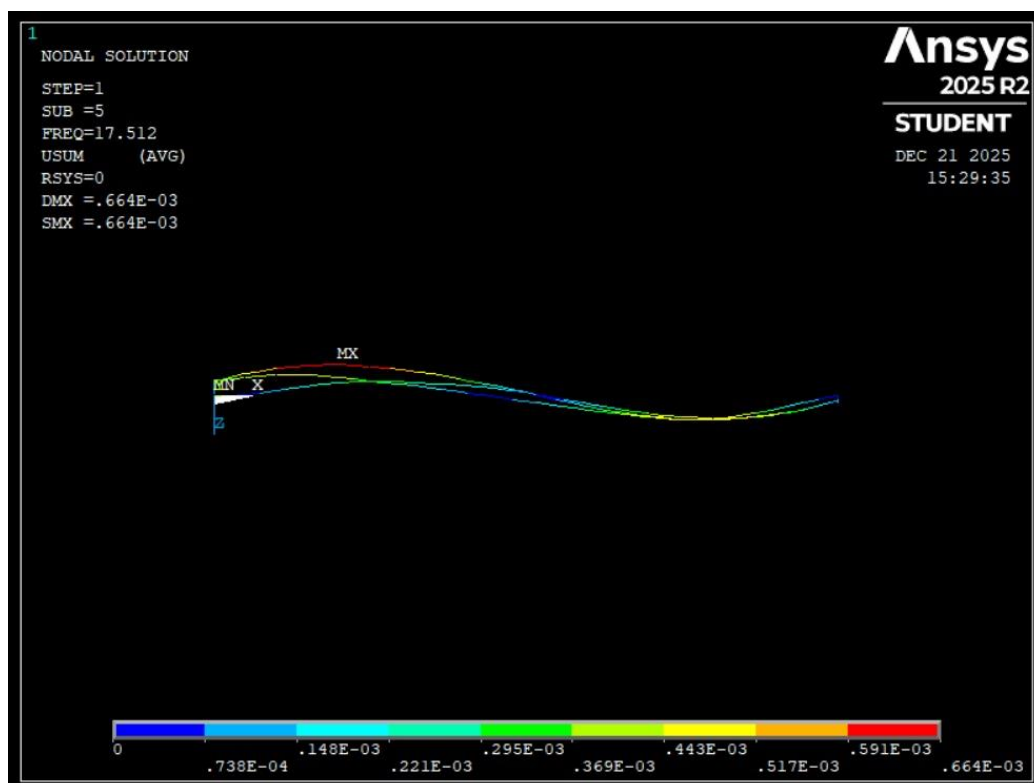
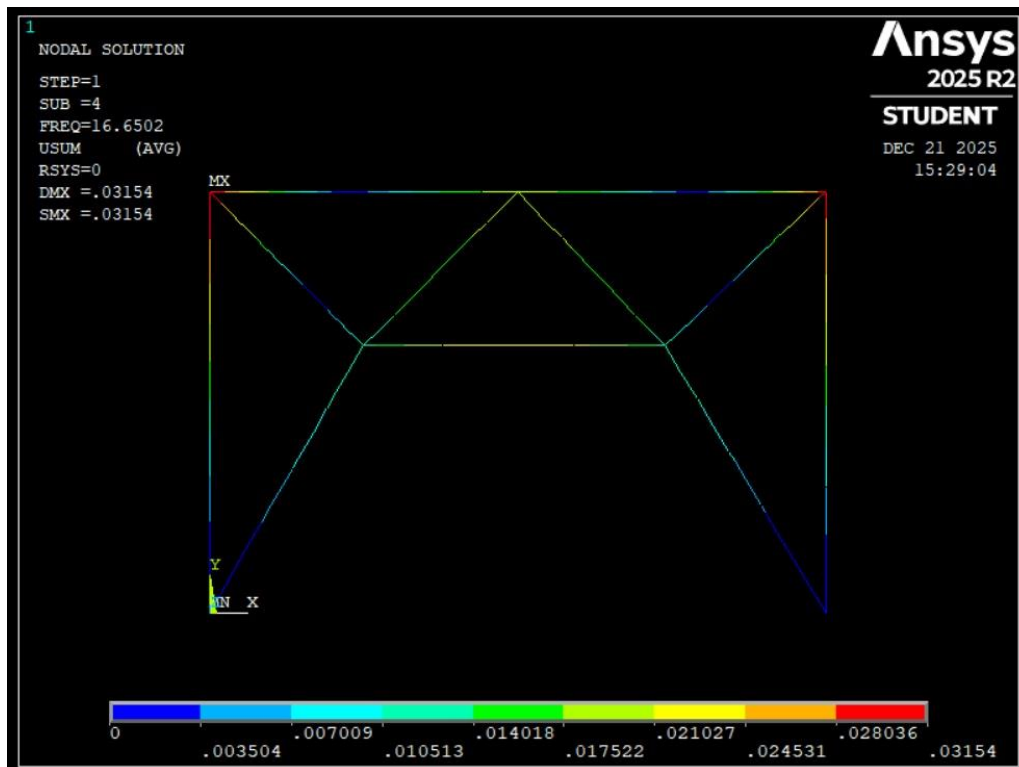
Mod 3



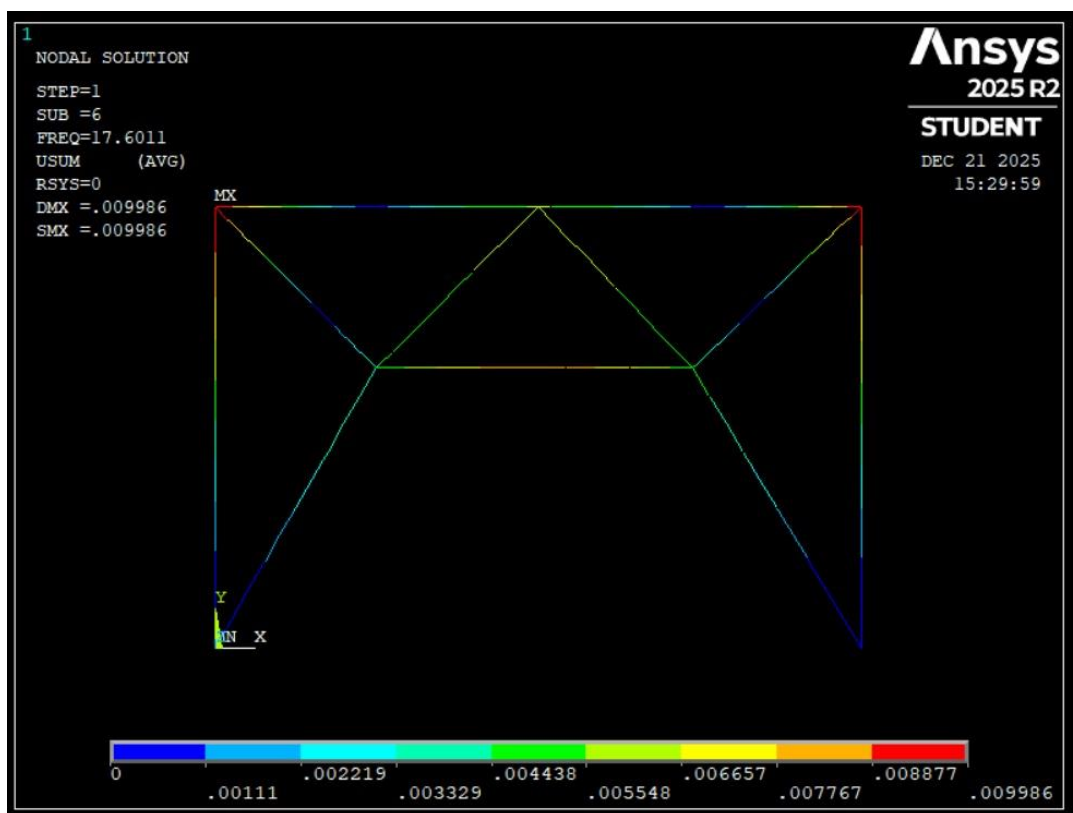
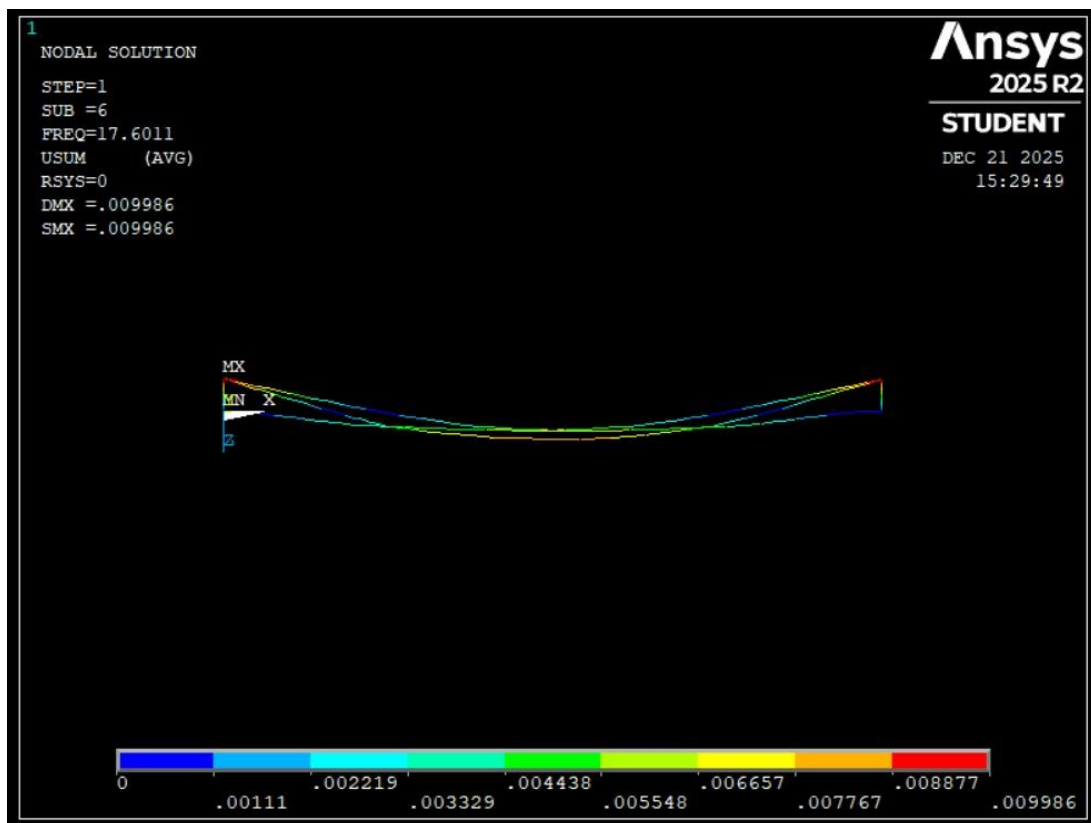
Mod 4



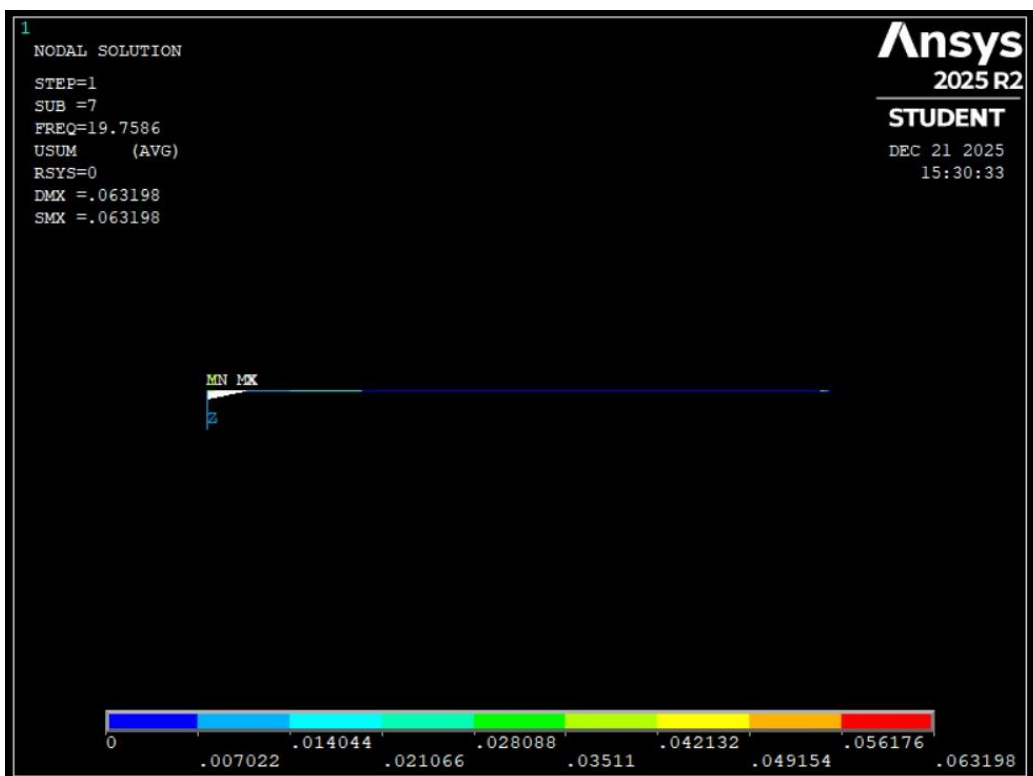
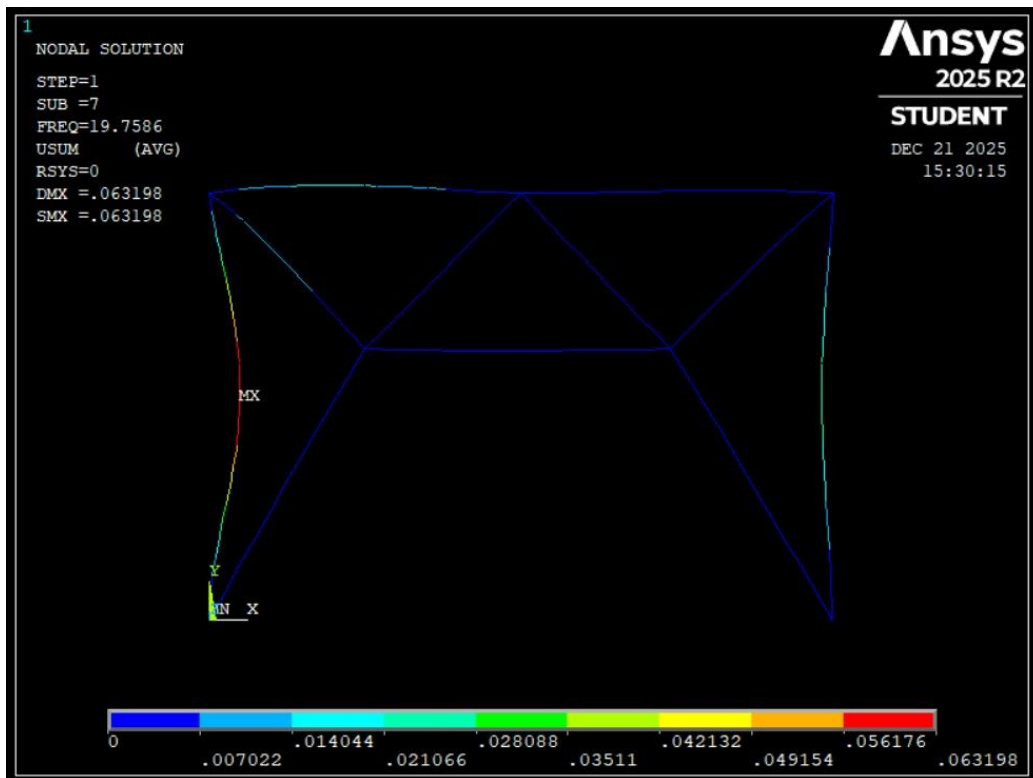
Mod 5



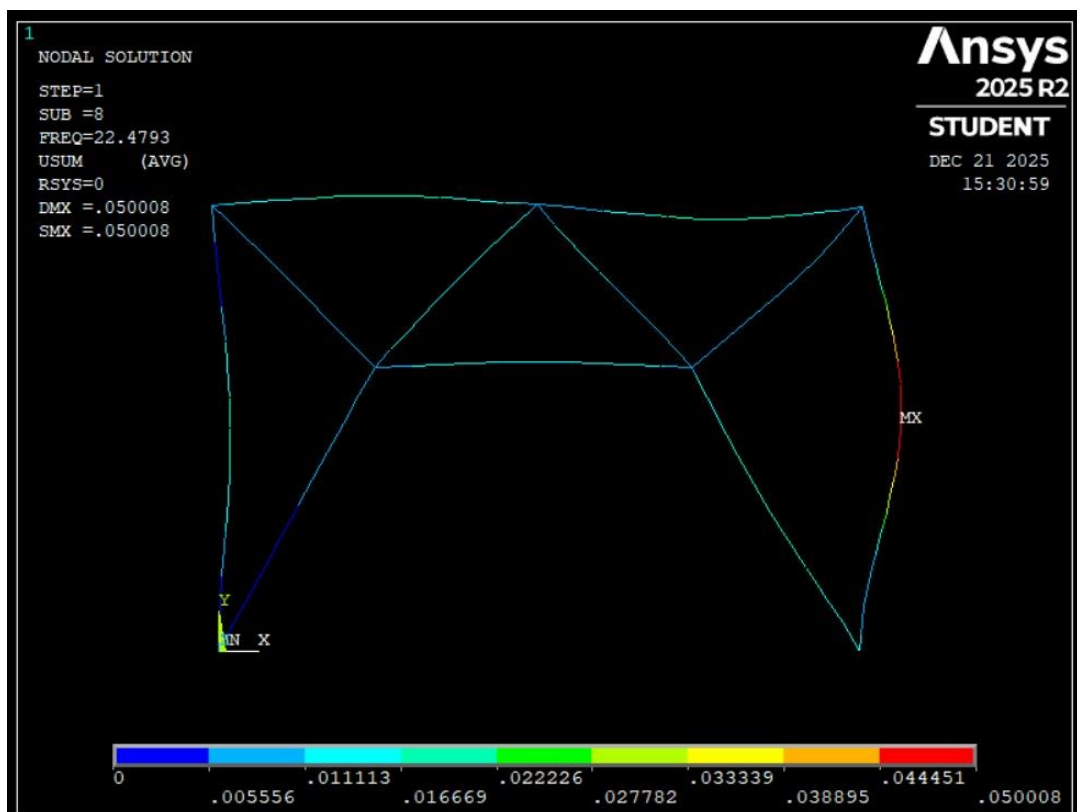
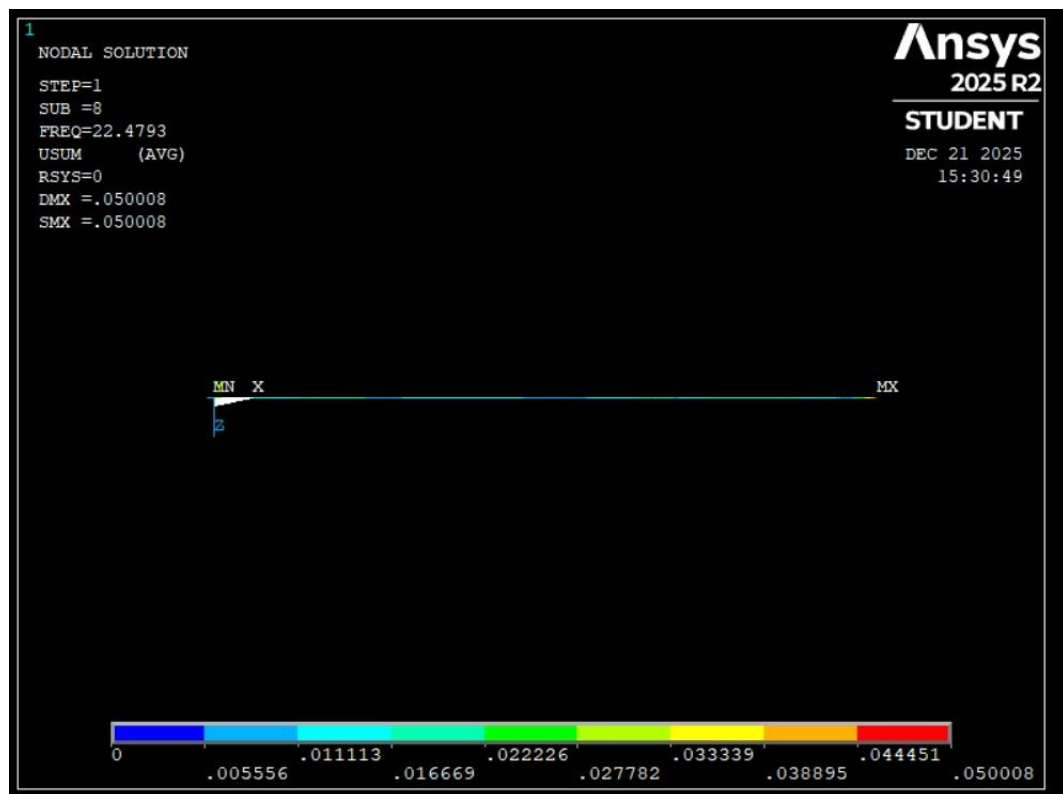
Mod 6



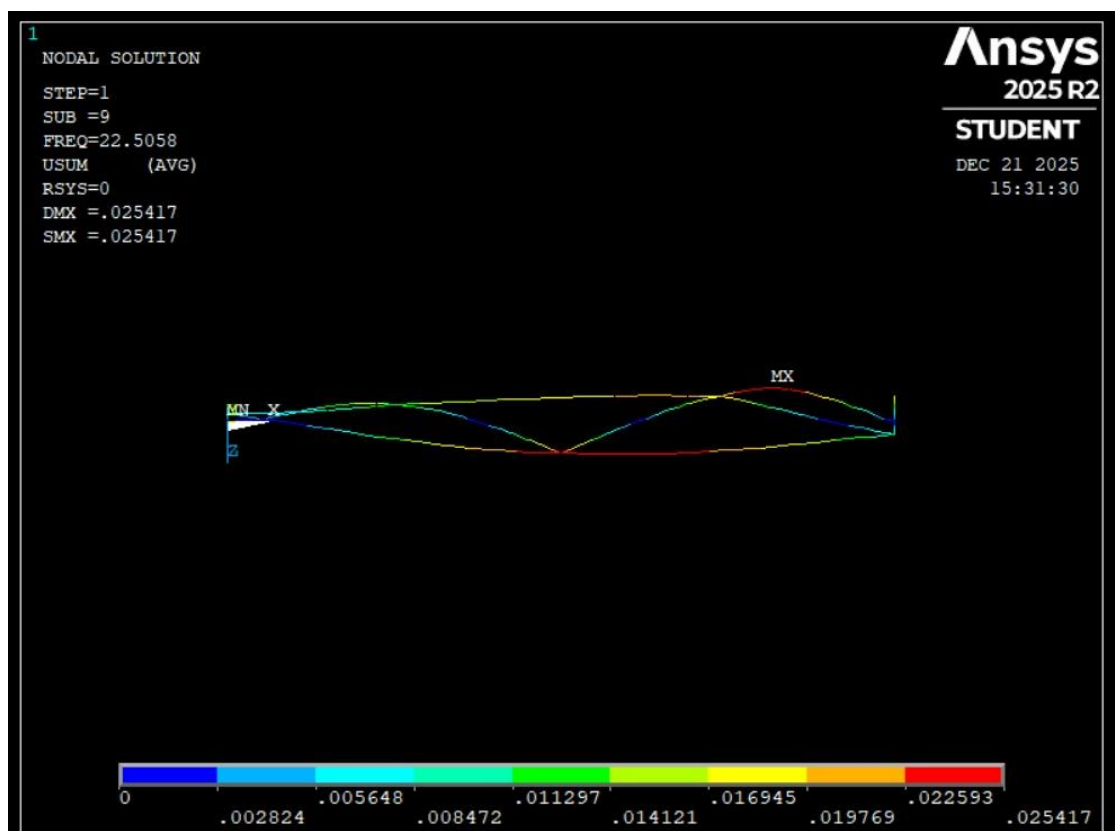
Mod 7



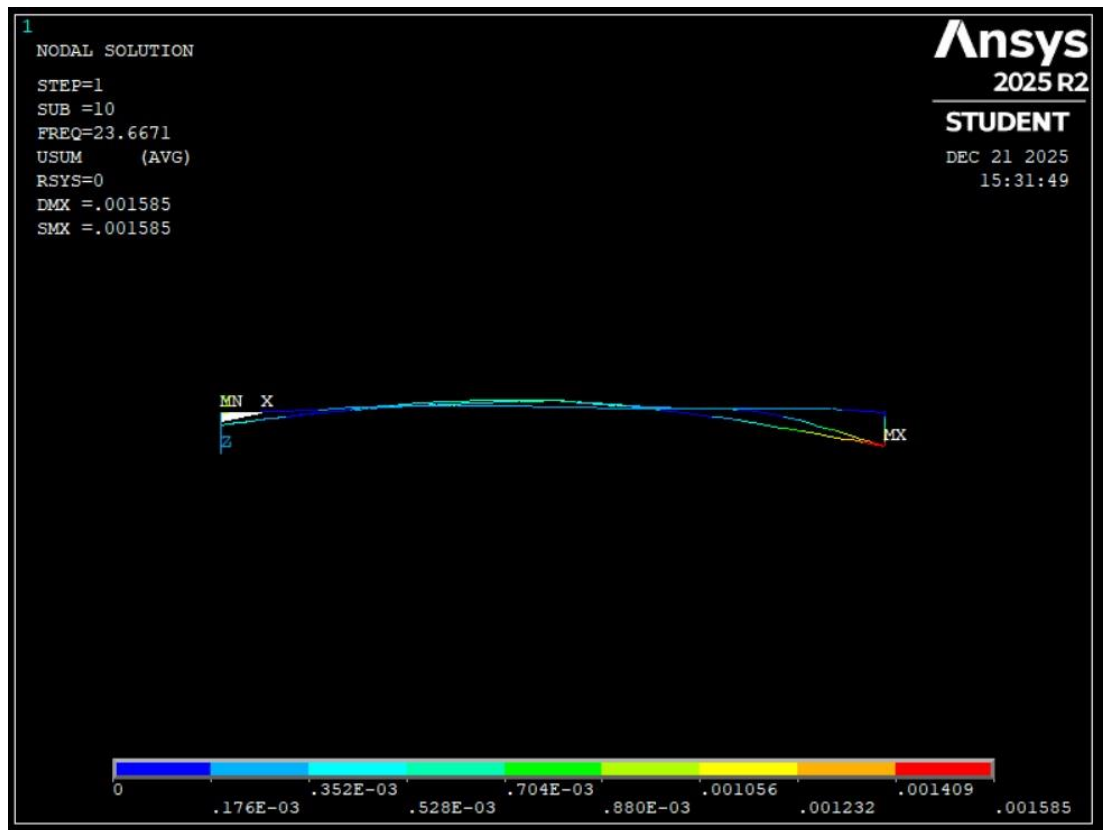
Mod 8



Mod 9



Mod 10



I KESİT APDL KODLARI

/BATCH

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 16:00:32

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,0

/REPLOT,RESIZE

/PREP7

SAVE,,,,ALL

FINISH

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 16:01:30

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl'

/FILENAME,uyg1,1

/BATCH

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 19:57:52

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,0

/REPLOT,RESIZE

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 19:58:05

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl'

/REPLOT,RESIZE

```

/FILNAME,Deneme_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, A1, 0
SECOFFSET, CENT
SECDATA,0.15,0.025,0,0,0,0,0,0,0,0,0
SECTYPE, 2, BEAM, RECT, A2, 0
SECOFFSET, CENT
SECDATA,0.075,0.025,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,,-0.3,,
!*
FINISH
/SOL
FINISH
/PREP7
K,1,,,
K,2,,-0.3,,
/DIST, 1 ,0.924021,1
/REP,FAST
LSTR, 1, 2
/ZOOM,1,BACK
/DIST,1,1.37174211248,1
/REP,FAST
LSTR, 1, 2
!*

```

```

LATT,1,,1,,1
FLST,5,1,4,ORDE,1
FITEM,5,1
CM,_Y,LINE
LSEL,,,P51X
CM,_Y1,LINE
CMSEL,_,Y
!*
LESIZE,_Y1,,,,,1
!*
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:43:56
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7      ! Preprocessor'a giris
/TITLE, Grup 1 - Kafes #1 Analizi (LINK180)
! 1. Parametre Tanımlamaları
*SET,L , 0.6      ! Uzunluk parametresi (m)
*SET,P , 1000     ! Kuvvet parametresi (N) (1 kN = 1000 N)
*SET,E_MOD , 200E9  ! Young Modulu (Pa) (200 GPa = 200e9 N/m^2)
*SET,AREA , 1.963E-3  ! Kesit Alanı (m^2) (d=50mm için)

```

! 2. Eleman Tipi Tanımlaması

ET,1,LINK180 ! LINK180 eleman tipini tanımla

! 3. Malzeme Özellikleri Tanımlaması

MPTEMP,,, ! Malzeme özellikleri tablo olustur

MP,EX,1,E_MOD ! Young Modulu (Malzeme 1 için)

! 4. Gerçek Sabitler (Real Constants) Tanımlaması

R,1,AREA ! Kesit alanı (Real Constant 1 için)

! 5. Anahtar Noktalar (Keypoints) Tanımlaması (Dugum Koordinatları)

! K, Keypoint No, X, Y, Z (Z=0 olarak alındı)

K,1,0,0,0 ! A dugumu

K,2,L,L,0 ! B dugumu

K,3,2*L,L,0 ! C dugumu

K,4,3*L,0,0 ! D dugumu

K,5,L,0,0 ! E dugumu

K,6,2*L,0,0 ! F dugumu

! 6. Elemanları Olusturma

! L, Keypoint Başlangıç, Keypoint Bitiş

! Elemanların sıralaması manuel çözümdeki ile aynı olmaya çalışıldı

E,1,2 ! Eleman 1: A-B

E,2,3 ! Eleman 2: B-C

E,3,4 ! Eleman 3: C-D

E,4,5 ! Eleman 4: A-E

E,5,6 ! Eleman 5: E-F

E,6,4 ! Eleman 6: F-D (D'den F'ye olarak kabul edelim)

E,7,5 ! Eleman 7: B-E (B->E)

E,8,6 ! Eleman 8: C-F (C->F)

E,9,6 ! Eleman 9: A-F (A->F) - Bu eleman yok, K, Keypoint no sırası ile bağlı olacak

E,10,5 ! Eleman 10: D-E (D->E) - Bu eleman yok.

! Yukarıdaki eleman numaralandırma Kafes #1'in Aşemasından doğrudan olmayabilir.

! Aşağıdaki tablodaki bilgiler eleman olarak ele alınır:

! Döner Numaralar: 1(A), 2(B), 3(C), 4(D), 5(E), 6(F)

E,1,2 ! A-B

E,2,3 ! B-C

E,3,4 ! C-D

```

E,1,5 ! A-E
E,5,6 ! E-F
E,6,4 ! F-D
E,2,5 ! B-E
E,3,6 ! C-F
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:54:16
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:54:42
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\'
/FILNAME,Homework_1,0
/PREP7
/TITLE,MAK4285 PROJE - GRUP 1 - KAFES #1 - LINK180 ELEMANI
*SET,L , 0.6
*SET,P , 1000
*SET,E_MOD , 200E9
*SET,AREA , 1.963E-3
ET,1,LINK180
KEYOPT,1,3,2
MP,EX,1,E_MOD
R,1,AREA
K,1,0,0,0
K,2,L,L,0
K,3,2*L,L,0
K,4,3*L,0,0
K,5,L,0,0

```

```

K,6,2*L,0,0
TYPE,1
REAL,1
MAT,1
E,1,2
E,2,3
E,3,4
E,1,5
E,5,6
E,6,4
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   12:50:35
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Exp_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.05,0.01,0,0,0,0,0,0,0,0,0

```

```

SECTYPE, 2, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.03,0.01,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,,-0.2,,
!*
K,1,0,0,0,
K,2,0,-0.2,0,
LSTR, 1, 2
CM,_Y,LINE
LSEL, , , , 1
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,3
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
SMRT,6
SMRT,OFF
SMRT,6
SMRT,7
SMRT,6
SMRT,5
SMRT,4
SMRT,OFF
SMRT,4
SMRT,5
SMRT,6
SMRT,OFF

```

```

LMESH,    1
LMESH,    1
LMESH,    1
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST

```

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   11:20:38
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:14:43
/input,menust,tmp,"
/GRA,POWER

```

```

/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Finite_Elements_Project,0
/PREP7
!*
ET,1,LINK180
!*
FINISH
/SOL
FINISH
/PREP7
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
!*
!*
!*
!*
!*
!*
!*
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:37:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*

```

```

/REPLOT,RESIZE
/FILNAME,Project_1,0
!*
/NOPR
KEYW,PR_SET,1
KEYW,PR_STRUC,1
KEYW,PR_THERM,0
KEYW,PR_FLUID,0
KEYW,PR_ELMAG,0
KEYW,MAGNOD,0
KEYW,MAGEDG,0
KEYW,MAGHFE,0
KEYW,MAGELC,0
KEYW,PR_MULTI,0
/GO
!*
/COM,
/COM,Preferences for GUI filtering have been set to display:
/COM, Structural
!*
/PREP7
!*
ET,1,LINK180
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,2e11
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDE,EX,1
MPDE,PRXY,1
MPDATA,EX,1,,200e9

```

MPDATA,PRXY,1,,0.3

!*
!*
!*
!*
SECTYPE,1,LINK, ,rect

SECDATA,0.01,

SECCONTROL,0,0

!*
N,1,,,,,,,,

N,2,,6,2837,,,,,

N,2,,6,2837,,,,,

N,2,,6,2837,,,,,

N,3,2.3,3.9837,,,,,

N,4,4.6,6.2837,,,,,

N,5,6.9,3.9837,,,,,

N,6,9.2,6.2837,,,,,

N,7,9.2,,,,,,

N,7,9.2,,,,,,

/DIST, 1 ,1.082226,1

/REP,FAST

/DIST, 1 ,1.082226,1

/REP,FAST

/DIST, 1 ,1.082226,1

/REP,FAST

/DIST, 1 ,1.082226,1

/REP,FAST

/DIST, 1 ,1.082226,1

/REP,FAST

/DIST, 1 ,1.082226,1

/REP,FAST

FLST,2,2,1

FITEM,2,1

FITEM,2,2

E,P51X

FLST,2,2,1
FITEM,2,1
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,6
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,6
E,P51X
FLST,2,2,1
FITEM,2,6

```

FITEM,2,7
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,7
E,P51X
FINISH
/SOL
FLST,2,1,1,ORDE,1
FITEM,2,1
!*
/GO
D,P51X,ALL,0, , , , , , ,
FLST,2,1,1,ORDE,1
FITEM,2,7
!*
/GO
D,P51X,UY,0, , , ,UZ,VELY,VELZ, , ,
FLST,2,1,1,ORDE,1
FITEM,2,2
!*
/GO
F,P51X,FY,-3800
FLST,2,1,1,ORDE,1
FITEM,2,4
!*
/GO
F,P51X,FY,-950
FLST,2,1,1,ORDE,1
FITEM,2,6
!*
/GO
F,P51X,FX,1900
/STATUS,SOLU

```

```

SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
PRNSOL,U,COMP
NPLOT
/REPLOT
!*
/VSCALE,1,1,0
!
!*
PLVECT,U,,,VECT,ELEM,ON,0
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
PLDISP,1
FINISH
! /EXIT,MODEL
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:30:08
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0

```

```

/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:30:22
/REPLOT,RESIZE
RESUME,'Project_1','db','C:\Users\tarik\0,0
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:30:31
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/AUX12
FINISH
/POST1
FINISH
/POST26
FINISH
/SOL
/STATUS,SOLU
SOLVE
!*
!*
!*
FINISH
/SOLUTION
ANTYPE,0
!*

```

```

FINISH
! /EXIT,NOSAV

/BATCH

/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    13:46:27

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,,0

/REPLOT,RESIZE

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    13:46:38

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\

/REPLOT,RESIZE

/FILNAME,Project_rect,0

/PREP7

!*

ET,1,BEAM188

!*

SECTYPE, 1, BEAM, RECT, , 0

SECOFFSET, CENT

SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0

SECTYPE, 1, BEAM, RECT, , 0

SECOFFSET, CENT

SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0

N,1,,,,,,,,

N,2,,6.2837,,,,

N,3,2.3,3.9837,,,,

N,4,4.6,6.2837,,,,

N,5,6.9,3.9837,,,,

N,6,9.2,6.2837,,,,

```

```

N,7,9.2,0,,,,,
N,7,9.2,0,,,,,
FINISH
/POST1
FINISH
/PREP7
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FLST,2,2,1
FITEM,2,1
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,1
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X

```

FLST,2,2,1
 FITEM,2,5
 FITEM,2,4
 E,P51X
 FLST,2,2,1
 FITEM,2,4
 FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,6
 FITEM,2,7
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,7
 E,P51X
 FLST,3,1,8
 FITEM,3,0.5E-01,0,0
 K, ,P51X
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1


```

MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 3, 4
LSTR, 3, 5
LSTR, 5, 4
LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL
FLST,2,1,3,ORDE,1

```

```

FITEM,2,1
!*
/GO
DK,P51X,,,0,ALL,,,,,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ,,,0,UY,,,,,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,3800
FLST,2,1,3,ORDE,1
FITEM,2,4
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,7,3,ORDE,2
FITEM,2,1
FITEM,2,-7
!*
!*
!*
FINISH
/PREP7
FINISH
/SOL
LSCLEAR,ALL
/DIST, 1 ,0.924021,1
/REP,FAST

```

```
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FINISH
/PREP7
```

```

K,7,9.2,0,,
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:16:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:30:49
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:31:35
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Project_rect_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860

```

```

SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.22837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 5, 4
LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ, , ,0,UY, , , , ,

```

```

FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
SAVE
SAVE
SAVE
SAVE
/STATUS,SOLU
SOLVE
/STATUS,SOLU
SOLVE
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1

```
/REP,FAST
!*
FINISH
/POST1
SET,LIST
FINISH
/POST26
FINISH
/PREP7
FINISH
/SOL
FINISH
/POST1
/SHOW,WIN32C
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
!*
/SHRINK,0
/ESHAPE,1
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
```

```

/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
/SOL
FINISH
/POST1
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,MODEL
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   11:22:52
/input,menust,tmp,"
/GRA,POWER

```

```

/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/REP7
!*
ET,1,BEAM188
!*
ET,2,BEAM188
!*
/UI,BEAM,OFF
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,
K,2,,6.2837,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,

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K,6,9.2,6.2837,,
K,79,9.2,,,
K,7,9.2,,,
K,7,9.2,,,
K,7,9.2,,,
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST

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/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
KDELE,    7
FLST,2,7,3,ORDE,3
FITEM,2,1
FITEM,2,-6
FITEM,2,79
KDELE,P51X
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR,    1,    2
LSTR,    1,    3
LSTR,    3,    2
LSTR,    2,    4
LSTR,    4,    3
LSTR,    3,    5
LSTR,    5,    4
LSTR,    4,    6
LSTR,    6,    5
LSTR,    6,    7
LSTR,    7,    5
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1

```

```

!*
/GO
DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ, , ,0,UY, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
/STATUS,SOLU
SOLVE
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
!*

```

```

/SHRINK,0
/ESHAPE,1
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
FINISH
/POST1
/SHOW,WIN32C
/SHOW,WIN32C
RESUME,'file','db','.'
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    11:34:56
/REPLOT,RESIZE
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    14:33:53
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/REP7
!*
ET,1,BEAM188
!*
ET,2,BEAM188

```

```

!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7850
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.8,3.9837,,
K,6,9.2,6.2837,,
K,67,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 4, 5
LSTR, 5, 6
LSTR, 6, 4
LSTR, 5, 67
LSTR, 67, 6
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , ,0,ALL, , , , ,

```

```

FLST,2,1,3,ORDE,1
FITEM,2,67
!*
/GO
DK,P51X,UZ, , ,0,UY,ROTY,ROTZ, , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
FINISH
/PREP7
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/POST1

```

```

FINISH
/POST26
FINISH
/POST1
FINISH
/SOL
FINISH
/POST1
FINISH
/SOL
FINISH
/PREP7
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,1
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,,_Y

```

```

!*
LESIZE,_Y1, , ,10, , , ,1
!*
FLST,2,11,4,ORDE,2
FITEM,2,1
FITEM,2,-11
LMESH,P51X
GPLOT
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LAST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
!*
PRNSOL,U,COMP
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
FINISH
/SOL

```

```
FINISH
/PREP7
/UI,BEAM,OFF
FINISH
/SOL
FINISH
/PREP7
!*
FINISH
/SOL
!*
ANTYPE,2
!*
!*
MODEOPT,LANB,10
EQLV,SPAR
MXPAND,0,,0
LUMPM,0
PSTRES,0
!*
MODEOPT,LANB,10,0,10000, ,OFF
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LIST
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
```

```

/USER, 1
/FOC, 1, 4.61680535724 , 3.30150089379 , 0.841861639717E-01
/REPLO
!*
SET,LIST,999
/VIEW,1,,,1
/ANG,1
/REP,FAST
/VIEW,1,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,LIST,999
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,FIRST
!*
/EFACET,1

```

```
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
SET,NEXT
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
```

```

/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,,-1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
FINISH

```

```

/PREP7
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
FINISH
/SOL
!*
ANTYPE,0
/VIEW,1,,,1
/ANG,1
/REP,FAST
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
!*
PRNSOL,U,COMP
FINISH
/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH
/POST1

```

```

!*
PRNSOL,U,COMP
FINISH
/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
SET,LIST
!*
PRNSOL,U,COMP
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1

```

```
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
```

```
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
!*
!*
!*
SAVE
!*
!*
!*
!*
!*
!*
!*
FINISH
/PREP7
IGESOUT,'Apdl','txt','Desktop\\',0
FINISH
!*
```

DİKDÖRTGEN KESİT APDL KODLARI

/BATCH

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 16:00:32

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,0

/REPLOT,RESIZE

/PREP7

SAVE,,,ALL

FINISH

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 16:01:30

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\'

/FILENAME,uyg1,1

/BATCH

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 19:57:52

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,0

/REPLOT,RESIZE

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 19:58:05

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\'

```

/REPLOT,RESIZE
/FILNAME,Deneme_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, A1, 0
SECOFFSET, CENT
SECDATA,0.15,0.025,0,0,0,0,0,0,0,0,0
SECTYPE, 2, BEAM, RECT, A2, 0
SECOFFSET, CENT
SECDATA,0.075,0.025,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,-0.3,,
!*
FINISH
/SOL
FINISH
/PREP7
K,1,,,
K,2,-0.3,,
/DIST, 1 ,0.924021,1
/REP,FAST
LSTR, 1, 2
/ZOOM,1,BACK
/DIST,1,1.37174211248,1
/REP,FAST
LSTR, 1, 2

```

```

!*
LATT,1,,1,,1
FLST,5,1,4,ORDE,1
FITEM,5,1
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1,,,,,,,,1
!*
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:43:56
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7      ! Preprocessor'a giris
/TITLE, Grup 1 - Kafes #1 Analizi (LINK180)
! 1. Parametre Tanımlamaları
*SET,L , 0.6      ! Uzunluk parametresi (m)
*SET,P , 1000     ! Kuvvet parametresi (N) (1 kN = 1000 N)
*SET,E_MOD , 200E9    ! Young Modulu (Pa) (200 GPa = 200e9 N/m^2)

```

*SET,AREA , 1.963E-3 ! Kesit Alanı (m²) (d=50mm için)

! 2. Eleman Tipi Tanımlaması

ET,1,LINK180 ! LINK180 eleman tipini tanımla

! 3. Malzeme Özellikleri Tanımlaması

MPTEMP,,,, ! Malzeme özellikleri tablo oluşturun

MP,EX,1,E_MOD ! Young Modülü (Malzeme 1 için)

! 4. Gerçek Sabitler (Real Constants) Tanımlaması

R,1,AREA ! Kesit alanı (Real Constant 1 için)

! 5. Anahtar Noktalar (Keypoints) Tanımlaması (Düğüm Koordinatları)

! K, Keypoint No, X, Y, Z (Z=0 olarak alındı)

K,1,0,0,0 ! A düğümü

K,2,L,L,0 ! B düğümü

K,3,2*L,L,0 ! C düğümü

K,4,3*L,0,0 ! D düğümü

K,5,L,0,0 ! E düğümü

K,6,2*L,0,0 ! F düğümü

! 6. Elemanları Oluşturma

! L, Keypoint Başlangıcı, Keypoint Bitisi

! Elemanların sıralaması manuel çözümdeki ile aynı olmaya çalışıldı

E,1,2 ! Eleman 1: A-B

E,2,3 ! Eleman 2: B-C

E,3,4 ! Eleman 3: C-D

E,4,5 ! Eleman 4: A-E

E,5,6 ! Eleman 5: E-F

E,6,4 ! Eleman 6: F-D (D'den F'ye olarak kabul edelim)

E,7,5 ! Eleman 7: B-E (B->E)

E,8,6 ! Eleman 8: C-F (C->F)

E,9,6 ! Eleman 9: A-F (A->F) - Bu eleman yok, K, Keypoint no sırası ile bağlı olacak

E,10,5 ! Eleman 10: D-E (D->E) - Bu eleman yok.

! Yukarıdaki eleman numaralandırma Kafes #1'in oluşturulmasından doğrudan olmayabilir.

! Aşağıdaki tanımlanan çizgileri eleman olarak ele alın:

! Döner Numaralar: 1(A), 2(B), 3(C), 4(D), 5(E), 6(F)

E,1,2 ! A-B

E,2,3 ! B-C

```

E,3,4 ! C-D
E,1,5 ! A-E
E,5,6 ! E-F
E,6,4 ! F-D
E,2,5 ! B-E
E,3,6 ! C-F
/BATCH

/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:54:16

/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/CLEAR,START

/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:54:42

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/FILNAME,Homework_1,0

/PREP7

/TITLE,MAK4285 PROJE - GRUP 1 - KAFES #1 - LINK180 ELEMANI

*SET,L , 0.6
*SET,P , 1000
*SET,E_MOD , 200E9
*SET,AREA , 1.963E-3
ET,1,LINK180
KEYOPT,1,3,2
MP,EX,1,E_MOD
R,1,AREA
K,1,0,0,0
K,2,L,L,0
K,3,2*L,L,0
K,4,3*L,0,0

```

```

K,5,L,0,0
K,6,2*L,0,0
TYPE,1
REAL,1
MAT,1
E,1,2
E,2,3
E,3,4
E,1,5
E,5,6
E,6,4
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   12:50:35
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Exp_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT

```

```

SECDATA,0.05,0.01,0,0,0,0,0,0,0,0,0
SECTYPE, 2, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.03,0.01,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,,-0.2,,
!*
K,1,0,0,0,
K,2,0,-0.2,0,
LSTR, 1, 2
CM,_Y,LINE
LSEL,, , , 1
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,3
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
SMRT,6
SMRT,OFF
SMRT,6
SMRT,7
SMRT,6
SMRT,5
SMRT,4
SMRT,OFF
SMRT,4
SMRT,5
SMRT,6

```

```
SMRT,OFF
LMESH, 1
LMESH, 1
LMESH, 1
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
```

```

/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   11:20:38
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:14:43
/input,menust,tmp,"

```

```

/GRAB,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Finite_Elements_Project,0
/REP7
!*
ET,1,LINK180
!*
FINISH
/SOL
FINISH
/REP7
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
!*
!*
!*
!*
!*
!*
!*
!*
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:37:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\

```

```

!*
/REPLOT,RESIZE
/FILNAME,Project_1,0
!*
/NOPR
KEYW,PR_SET,1
KEYW,PR_STRUC,1
KEYW,PR_THERM,0
KEYW,PR_FLUID,0
KEYW,PR_ELMAG,0
KEYW,MAGNOD,0
KEYW,MAGEDG,0
KEYW,MAGHFE,0
KEYW,MAGELC,0
KEYW,PR_MULTI,0
/GO
!*
/COM,
/COM,Preferences for GUI filtering have been set to display:
/COM, Structural
!*
/PREP7
!*
ET,1,LINK180
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,2e11
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDE,EX,1
MPDE,PRXY,1

```

MPDATA,EX,1,,200e9

MPDATA,PRXY,1,,0.3

!*
!*
!*
!*
SECTYPE,1,LINK, ,rect

SECDATA,0.01,

SECCONTROL,0,0

!*
N,1,,,,,,
N,2,,6.2837,,,,,
N,2,,6.2837,,,,,
N,3,2.3,3.9837,,,,,
N,4,4.6,6.2837,,,,,
N,5,6.9,3.9837,,,,,
N,6,9.2,6.2837,,,,,
N,7,9.2,,,,,,
N,7,9.2,,,,,,
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FLST,2,2,1
FITEM,2,1
FITEM,2,2

E,P51X
FLST,2,2,1
FITEM,2,1
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,6
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,6
E,P51X
FLST,2,2,1

FITEM,2,6
 FITEM,2,7
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,7
 E,P51X
 FINISH
 /SOL
 FLST,2,1,1,ORDE,1
 FITEM,2,1
 !*
 /GO
 D,P51X,ALL,0, , , , , , , ,
 FLST,2,1,1,ORDE,1
 FITEM,2,7
 !*
 /GO
 D,P51X,UY,0, , , ,UZ,VELY,VELZ, , ,
 FLST,2,1,1,ORDE,1
 FITEM,2,2
 !*
 /GO
 F,P51X,FY,-3800
 FLST,2,1,1,ORDE,1
 FITEM,2,4
 !*
 /GO
 F,P51X,FY,-950
 FLST,2,1,1,ORDE,1
 FITEM,2,6
 !*
 /GO
 F,P51X,FX,1900

```

/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
PRNSOL,U,COMP
NPLLOT
/REPLOT
!*
/VSCALE,1,1,0
!
!*
PLVECT,U,, , VECT,ELEM,ON,0
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
PLDISP,1
FINISH
! /EXIT,MODEL
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:30:08
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE

```

```

WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:30:22
/REPLOT,RESIZE
RESUME,'Project_1','db','C:\Users\tarik\','0,0
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:30:31
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/AUX12
FINISH
/POST1
FINISH
/POST26
FINISH
/SOL
/STATUS,SOLU
SOLVE
!*
!*
!*
FINISH
/SOLUTION
ANTYPE,0

```

```

!*
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   13:46:27
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   13:46:38
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Project_rect,0
/PREP7
!*
ET,1,BEAM188
!*
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
N,1,,,,,,,,
N,2,,6.2837,,,,
N,3,2.3,3.9837,,,,
N,4,4.6,6.2837,,,,
N,5,6.9,3.9837,,,,

```

N,6,9.2,6.2837,,,,,
 N,7,9.2,0,,,,,
 N,7,9.2,0,,,,,
 FINISH
 /POST1
 FINISH
 /PREP7
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 FLST,2,2,1
 FITEM,2,1
 FITEM,2,2
 E,P51X
 FLST,2,2,1
 FITEM,2,1
 FITEM,2,3
 E,P51X
 FLST,2,2,1
 FITEM,2,3
 FITEM,2,2
 E,P51X
 FLST,2,2,1
 FITEM,2,2
 FITEM,2,4
 E,P51X
 FLST,2,2,1
 FITEM,2,3
 FITEM,2,4
 E,P51X
 FLST,2,2,1
 FITEM,2,3
 FITEM,2,5

E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,4
 E,P51X
 FLST,2,2,1
 FITEM,2,4
 FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,6
 FITEM,2,7
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,7
 E,P51X
 FLST,3,1,8
 FITEM,3,0.5E-01,0,0
 K, ,P51X
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST


```

MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 3, 4
LSTR, 3, 5
LSTR, 5, 4
LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL

```

```

FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ, , ,0,UY, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,3800
FLST,2,1,3,ORDE,1
FITEM,2,4
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,7,3,ORDE,2
FITEM,2,1
FITEM,2,-7
!*
!*
!*
FINISH
/PREP7
FINISH
/SOL
LSCLEAR,ALL
/DIST, 1 ,0.924021,1

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FINISH

```

/PREP7
K,7,9.2,0,,
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:16:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:30:49
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:31:35
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Project_rect_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0

```

```

MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.22837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 5, 4
LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO

```

```

DK,P51X,UZ, , ,0,UY, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
SAVE
SAVE
SAVE
SAVE
/STATUS,SOLU
SOLVE
/STATUS,SOLU
SOLVE
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST

```

/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST

```
/DIST, 1 ,0.924021,1
/REP,FAST
!*
FINISH
/POST1
SET,LIST
FINISH
/POST26
FINISH
/PREP7
FINISH
/SOL
FINISH
/POST1
/SHOW,WIN32C
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
!*
/SHRINK,0
/ESHAPE,1
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
```

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
/SOL
FINISH
/POST1
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,MODEL
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   11:22:52
/input,menust,tmp,"

```

```

/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7
!*
ET,1,BEAM188
!*
ET,2,BEAM188
!*
/UI,BEAM,OFF
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,
K,2,,6.2837,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,

```

K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,79,9.2,,,
K,7,9.2,,,
K,7,9.2,,,
K,7,9.2,,,
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST

```

/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
KDELE,    7
FLST,2,7,3,ORDE,3
FITEM,2,1
FITEM,2,-6
FITEM,2,79
KDELE,P51X
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR,    1,    2
LSTR,    1,    3
LSTR,    3,    2
LSTR,    2,    4
LSTR,    4,    3
LSTR,    3,    5
LSTR,    5,    4
LSTR,    4,    6
LSTR,    6,    5
LSTR,    6,    7
LSTR,    7,    5
FINISH
/SOL
FLST,2,1,3,ORDE,1

```

```

FITEM,2,1
!*
/GO
DK,P51X,,,0,ALL,,,,,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ,,,0,UY,,,,,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
/STATUS,SOLU
SOLVE
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*

```

```

!*
/SHRINK,0
/ESHAPE,1
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
FINISH
/POST1
/SHOW,WIN32C
/SHOW,WIN32C
RESUME,'file','db',''
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    11:34:56
/REPLOT,RESIZE
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    14:33:53
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
/REP7
!*
ET,1,BEAM188
!*

```

```

ET,2,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7850
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.8,3.9837,,
K,6,9.2,6.2837,,
K,67,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 4, 5
LSTR, 5, 6
LSTR, 6, 4
LSTR, 5, 67
LSTR, 67, 6
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO

```

```

DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,67
!*
/GO
DK,P51X,UZ, , ,0,UY,ROTY,ROTZ, , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
FINISH
/PREP7
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH

```

```

/POST1
FINISH
/POST26
FINISH
/POST1
FINISH
/SOL
FINISH
/POST1
FINISH
/SOL
FINISH
/PREP7
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,1
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE

```

```

CMSEL,,_Y
!*
LESIZE,_Y1,,10,,,,1
!*
FLST,2,11,4,ORDE,2
FITEM,2,1
FITEM,2,-11
LMESH,P51X
GPLOT
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LAST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
!*
PRNSOL,U,COMP
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
FINISH

```

```
/SOL
FINISH
/PREP7
/UI,BEAM,OFF
FINISH
/SOL
FINISH
/PREP7
!*
FINISH
/SOL
!*
ANTYPE,2
!*
!*
MODEOPT,LANB,10
EQSLV,SPAR
MXPAND,0,,0
LUMPM,0
PSTRES,0
!*
MODEOPT,LANB,10,0,10000, ,OFF
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LIST
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
SET,NEXT
!*
/EFACET,1
```

```

PLNSOL, U,SUM, 0,1.0
/USER, 1
/FOC, 1, 4.61680535724 , 3.30150089379 , 0.841861639717E-01
/REPLO
!*
SET,LIST,999
/VIEW,1,,,1
/ANG,1
/REP,FAST
/VIEW,1,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,LIST,999
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,FIRST
!*

```

```

/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
SET,NEXT
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1

```

```

/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,,-1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST

```

```

FINISH
/PREP7
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
FINISH
/SOL
!*
ANTYPE,0
/VIEW,1,,,1
/ANG,1
/REP,FAST
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
!*
PRNSOL,U,COMP
FINISH
/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH

```

```

/POST1
!*
PRNSOL,U,COMP
FINISH

/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
SET,LIST
!*
PRNSOL,U,COMP
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0

```

```
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
```

```
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
!*
!*
!*
SAVE
!*
!*
!*
!*
!*
!*
FINISH
/PREP7
IGESOUT,'Apdl','txt','Desktop\ ',0
FINISH
!*
/PREP7
```

```
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0.018,0.0106,0,0,0,0,0
SAVE
```

LINK 180 APDL KODLARI

```
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   16:00:32
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7
SAVE,,,,ALL
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   16:01:30
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/FILNAME,uyg1,1
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   19:57:52
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
```

```

/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   19:58:05
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Deneme_1,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, A1, 0
SECOFFSET, CENT
SECDATA,0.15,0.025,0,0,0,0,0,0,0,0,0
SECTYPE, 2, BEAM, RECT, A2, 0
SECOFFSET, CENT
SECDATA,0.075,0.025,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,,-0.3,,
!*
FINISH
/SOL
FINISH
/PREP7
K,1,,,
K,2,,-0.3,,

```

```

/DIST,1,0.924021,1
/REP,FAST
LSTR,1,2
/ZOOM,1,BACK
/DIST,1,1.37174211248,1
/REP,FAST
LSTR,1,2
!*
LATT,1,1,,1
FLST,5,1,4,ORDE,1
FITEM,5,1
CM,_Y,LINE
LSEL,,,P51X
CM,_Y1,LINE
CMSEL,_,Y
!*
LESIZE,_Y1,,,,,,,,1
!*
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
!/EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:43:56
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0

```

```

/REPLOT,RESIZE

/PREP7          ! Preprocessor'a giris

/TITLE, Grup 1 - Kafes #1 Analizi (LINK180)

! 1. Parametre Tanımlamalar
*SET,L , 0.6      ! Uzunluk parametresi (m)
*SET,P , 1000     ! Kuvvet parametresi (N) (1 kN = 1000 N)
*SET,E_MOD , 200E9 ! Young Modulu (Pa) (200 GPa = 200e9 N/m^2)
*SET,AREA , 1.963E-3 ! Kesit Alanı (m^2) (d=50mm için)

! 2. Eleman Tipi Tanımlama
ET,1,LINK180     ! LINK180 eleman tipini tanımla

! 3. Malzeme Özellikleri Tanımlama
MPTEMP,,,,       ! Malzeme özellikleri tablo oluşturun
MP,EX,1,E_MOD    ! Young Modulu (Malzeme 1 için)

! 4. Gerçek Sabitler (Real Constants) Tanımlama
R,1,AREA         ! Kesit alanı (Real Constant 1 için)

! 5. Anahtar Noktalar (Keypoints) Tanımlama (Düğüm Koordinatları)
! K, Keypoint No, X, Y, Z (Z=0 olarak alındı)
K,1,0,0,0        ! A düğümü
K,2,L,L,0        ! B düğümü
K,3,2*L,L,0      ! C düğümü
K,4,3*L,0,0      ! D düğümü
K,5,L,0,0        ! E düğümü
K,6,2*L,0,0      ! F düğümü

! 6. Elemanları Oluşturma
! L, Keypoint Başlangıç, Keypoint Bitiş
! Elemanların sıralaması manuel çözümdeki ile aynı olmaya çalışıldı
E,1,2            ! Eleman 1: A-B
E,2,3            ! Eleman 2: B-C
E,3,4            ! Eleman 3: C-D
E,4,5            ! Eleman 4: A-E
E,5,6            ! Eleman 5: E-F
E,6,4            ! Eleman 6: F-D (D'den F'ye olarak kabul edelim)
E,7,5            ! Eleman 7: B-E (B->E)
E,8,6            ! Eleman 8: C-F (C->F)

```

E,9,6 ! Eleman 9: A-F (A->F) - Bu eleman yok, K, Keypoint no sirasi ile bagli olacak

E,10,5 ! Eleman 10: D-E (D->E) - Bu eleman yok.

! Yukarıdaki eleman numaralandırma Kafes #1'in Aşemasından doşrudan olmayabilir.

! Aşemadaki tşizgileri eleman olarak ele alalım:

! Dş Numaralar: 1(A), 2(B), 3(C), 4(D), 5(E), 6(F)

E,1,2 ! A-B

E,2,3 ! B-C

E,3,4 ! C-D

E,1,5 ! A-E

E,5,6 ! E-F

E,6,4 ! F-D

E,2,5 ! B-E

E,3,6 ! C-F

/BATCH

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 10:54:16

/input,menust,tmp,"

/GRA,POWER

/GST,ON

/PLO,INFO,3

/GRO,CURL,ON

/CPLANE,1

/REPLOT,RESIZE

WPSTYLE,,,,,,,,0

/CLEAR,START

/COM,ANSYS RELEASE 2025 R2 BUILD 25.2 UP20250519 10:54:42

/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl'

/FILENAME,Homework_1,0

/PREP7

/TITLE,MAK4285 PROJE - GRUP 1 - KAFES #1 - LINK180 ELEMANI

*SET,L , 0.6

*SET,P , 1000

*SET,E_MOD , 200E9

*SET,AREA , 1.963E-3

ET,1,LINK180

```

KEYOPT,1,3,2
MP,EX,1,E_MOD
R,1,AREA
K,1,0,0,0
K,2,L,L,0
K,3,2*L,L,0
K,4,3*L,0,0
K,5,L,0,0
K,6,2*L,0,0
TYPE,1
REAL,1
MAT,1
E,1,2
E,2,3
E,3,4
E,1,5
E,5,6
E,6,4
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   12:50:35
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Exp_1,0
/PREP7
!*
ET,1,BEAM188
!*

```

```

!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.05,0.01,0,0,0,0,0,0,0,0,0
SECTYPE, 2, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.03,0.01,0,0,0,0,0,0,0,0,0
SECTYPE,3,TAPER, ,
SECDATA, 1,,,
SECDATA, 2,,-0.2,,
!*
K,1,0,0,0,
K,2,0,-0.2,0,
LSTR, 1, 2
CM,_Y,LINE
LSEL,, , , 1
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,3
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
SMRT,6
SMRT,OFF
SMRT,6
SMRT,7

```

SMRT,6
SMRT,5
SMRT,4
SMRT,OFF
SMRT,4
SMRT,5
SMRT,6
SMRT,OFF
LMESH, 1
LMESH, 1
LMESH, 1
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    11:20:38
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE

```

```

WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    14:14:43
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,,0
/REPLOT,RESIZE
/FILNAME,Finite_Elements_Project,0
/PREP7
!*
ET,1,LINK180
!*
FINISH
/SOL
FINISH
/PREP7
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
!*
!*
!*
!*

```

```

!*
!*
!*
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:37:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*
/REPLOT,RESIZE
/FILNAME,Project_1,0
!*
/NOPR
KEYW,PR_SET,1
KEYW,PR_STRUC,1
KEYW,PR_THERM,0
KEYW,PR_FLUID,0
KEYW,PR_ELMAG,0
KEYW,MAGNOD,0
KEYW,MAGEDG,0
KEYW,MAGHFE,0
KEYW,MAGELC,0
KEYW,PR_MULTI,0
/GO
!*
/COM,
/COM,Preferences for GUI filtering have been set to display:
/COM, Structural
!*
/PREP7
!*
ET,1,LINK180
!*
!*
MPTEMP,,,,,,,,

```

```

MPTEMP,1,0
MPDATA,EX,1,,2e11
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDE,EX,1
MPDE,PRXY,1
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
!*
!*
!*
!*
SECTYPE,1,LINK, ,rect
SECDATA,0.01,
SECCONTROL,0,0
!*
N,1,,,,,,,,
N,2,,6.2837,,,,,
N,2,,6.2837,,,,,
N,3,2.3,3.9837,,,,,
N,4,4.6,6.2837,,,,,
N,5,6.9,3.9837,,,,,
N,6,9.2,6.2837,,,,,
N,7,9.2,,,,,,
N,7,9.2,,,,,,
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST

```

/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FLST,2,2,1
FITEM,2,1
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,1
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,2
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,4

FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,6
 E,P51X
 FLST,2,2,1
 FITEM,2,6
 FITEM,2,7
 E,P51X
 FLST,2,2,1
 FITEM,2,5
 FITEM,2,7
 E,P51X
 FINISH
 /SOL
 FLST,2,1,1,ORDE,1
 FITEM,2,1
 !*
 /GO
 D,P51X,ALL,0, , , , , , , ,
 FLST,2,1,1,ORDE,1
 FITEM,2,7
 !*
 /GO
 D,P51X,UY,0, , , ,UZ,VELY,VELZ, , ,
 FLST,2,1,1,ORDE,1
 FITEM,2,2
 !*
 /GO
 F,P51X,FY,-3800
 FLST,2,1,1,ORDE,1
 FITEM,2,4
 !*

```

/GO
F,P51X,FY,-950
FLST,2,1,1,ORDE,1
FITEM,2,6
!*
/GO
F,P51X,FX,1900
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
PRNSOL,U,COMP
NPLLOT
/REPLOT
!*
/VSCALE,1,1,0
!
!*
PLVECT,U, , , VECT,ELEM,ON,0
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
PLDISP,1
FINISH
! /EXIT,MODEL
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    10:30:08

```

```

/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:30:22
/REPLOT,RESIZE
RESUME,'Project_1','db','C:\Users\tarik\',0,0
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   10:30:31
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/AUX12
FINISH
/POST1
FINISH
/POST26
FINISH
/SOL
/STATUS,SOLU

```

```

SOLVE
!*
!*
!*
FINISH
/SOLUTION
ANTYPE,0
!*
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   13:46:27
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   13:46:38
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Project_rect,0
/PREP7
!*
ET,1,BEAM188
!*
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0

```

SECOFFSET, CENT
 SECDATA,0.1,0.1,0,0,0,0,0,0,0,0
 N,1,,,,,,
 N,2,,6.2837,,,,,
 N,3,2.3,3.9837,,,,,
 N,4,4.6,6.2837,,,,,
 N,5,6.9,3.9837,,,,,
 N,6,9.2,6.2837,,,,,
 N,7,9.2,0,,,,,
 N,7,9.2,0,,,,,
 FINISH
 /POST1
 FINISH
 /PREP7
 /DIST, 1 ,1.082226,1
 /REP,FAST
 /DIST, 1 ,1.082226,1
 /REP,FAST
 FLST,2,2,1
 FITEM,2,1
 FITEM,2,2
 E,P51X
 FLST,2,2,1
 FITEM,2,1
 FITEM,2,3
 E,P51X
 FLST,2,2,1
 FITEM,2,3
 FITEM,2,2
 E,P51X
 FLST,2,2,1
 FITEM,2,2
 FITEM,2,4
 E,P51X

FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,6
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,6
E,P51X
FLST,2,2,1
FITEM,2,6
FITEM,2,7
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,7
E,P51X
FLST,3,1,8
FITEM,3,0.5E-01,0,0
K, ,P51X
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1


```

!*
/FILNAME,Project_2,0
/PREP7
!*
ET,1,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 3, 4
LSTR, 3, 5

```

LSTR, 5, 4
 LSTR, 4, 6
 LSTR, 6, 5
 LSTR, 6, 7
 LSTR, 7, 5
 FINISH
 /SOL
 FLST,2,1,3,ORDE,1
 FITEM,2,1
 !*
 /GO
 DK,P51X, , , 0,ALL, , , , ,
 FLST,2,1,3,ORDE,1
 FITEM,2,7
 !*
 /GO
 DK,P51X,UZ, , , 0,UY, , , , ,
 FLST,2,1,3,ORDE,1
 FITEM,2,2
 !*
 /GO
 FK,P51X,FY,3800
 FLST,2,1,3,ORDE,1
 FITEM,2,4
 FLST,2,1,3,ORDE,1
 FITEM,2,2
 !*
 /GO
 FK,P51X,FY,-3800
 FLST,2,7,3,ORDE,2
 FITEM,2,1
 FITEM,2,-7
 !*
 !*

```
!*  
FINISH  
/PREP7  
FINISH  
/SOL  
LSCLEAR,ALL  
/DIST, 1 ,0.924021,1  
/REP,FAST  
/DIST, 1 ,0.924021,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,1.082226,1  
/REP,FAST  
/DIST, 1 ,0.924021,1  
/REP,FAST  
/DIST, 1 ,0.924021,1  
/REP,FAST  
/DIST, 1 ,0.924021,1  
/REP,FAST
```

```

FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FLST,2,2,3,ORDE,2
FITEM,2,1
FITEM,2,-2
FINISH
/PREP7
K,7,9.2,0,,
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   14:16:07
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:30:49
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   09:31:35
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
/REPLOT,RESIZE
/FILNAME,Project_rect_1,0
/PREP7
!*
ET,1,BEAM188
!*

```

```

!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.22837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 5, 4
LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1

```

```

!*
/GO
DK,P51X, , , ,0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ, , ,0,UY, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
SAVE
SAVE
SAVE
SAVE
/STATUS,SOLU
SOLVE
/STATUS,SOLU
SOLVE
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1

```

/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1

```
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
!*
FINISH
/POST1
SET,LIST
FINISH
/POST26
FINISH
/PREP7
FINISH
/SOL
FINISH
/POST1
/SHOW,WIN32C
!*
/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
!*
/SHRINK,0
/ESHAPE,1
/EFACET,1
```

```
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
/SOL
FINISH
/POST1
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
```

```

/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,MODEL

/BATCH

/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    11:22:52
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1
/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7
!*
ET,1,BEAM188
!*
ET,2,BEAM188
!*
/UI,BEAM,OFF
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7860
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0

```

```

SECOFFSET, CENT
SECDATA,0.02,0.05,0,0,0,0,0,0,0,0,0
K,1,,
K,2,,6.2837,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,79,9.2,,
K,7,9.2,,
K,7,9.2,,
K,7,9.2,,
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1

```

```

/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
KDELE,    7
FLST,2,7,3,ORDE,3
FITEM,2,1
FITEM,2,-6
FITEM,2,79
KDELE,P51X
K,1,,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.9,3.9837,,
K,6,9.2,6.2837,,
K,7,9.2,0,,
K,7,9.2,0,,
LSTR,    1,    2
LSTR,    1,    3
LSTR,    3,    2
LSTR,    2,    4
LSTR,    4,    3
LSTR,    3,    5
LSTR,    5,    4

```

```

LSTR, 4, 6
LSTR, 6, 5
LSTR, 6, 7
LSTR, 7, 5
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , 0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,7
!*
/GO
DK,P51X,UZ, , , 0,UY, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
/STATUS,SOLU
SOLVE
!*

```

```

/SHRINK,0
/ESHAPE,1.0
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
!*
/SHRINK,0
/ESHAPE,1
/EFACET,1
/RATIO,1,1,1
/CFORMAT,32,0
/REPLOT
!*
FINISH
/POST1
/SHOW,WIN32C
/SHOW,WIN32C
RESUME,'file','db',''
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    11:34:56
/REPLOT,RESIZE
/DIST, 1 ,1.082226,1
/REP,FAST
FINISH
! /EXIT,NOSAV
/BATCH
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2    UP20250519    14:33:53
/input,menust,tmp,"
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/CPLANE,1

```

```

/REPLOT,RESIZE
WPSTYLE,,,,,,,,0
/REPLOT,RESIZE
/PREP7
!*
ET,1,BEAM188
!*
ET,2,BEAM188
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7850
K,1,,,
K,2,,6.2837,,
K,3,2.3,3.9837,,
K,4,4.6,6.2837,,
K,5,6.8,3.9837,,
K,6,9.2,6.2837,,
K,67,9.2,0,,
LSTR, 1, 2
LSTR, 1, 3
LSTR, 3, 2
LSTR, 2, 4
LSTR, 4, 3
LSTR, 3, 5
LSTR, 4, 5
LSTR, 5, 6
LSTR, 6, 4
LSTR, 5, 67

```

```

LSTR, 67, 6
FINISH
/SOL
FLST,2,1,3,ORDE,1
FITEM,2,1
!*
/GO
DK,P51X, , , 0,ALL, , , , ,
FLST,2,1,3,ORDE,1
FITEM,2,67
!*
/GO
DK,P51X,UZ, , , 0,UY,ROTY,ROTZ, , , ,
FLST,2,1,3,ORDE,1
FITEM,2,2
!*
/GO
FK,P51X,FY,-3800
FLST,2,1,3,ORDE,1
FITEM,2,4
!*
/GO
FK,P51X,FY,-950
FLST,2,1,3,ORDE,1
FITEM,2,6
!*
/GO
FK,P51X,FX,1900
FINISH
/PREP7
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
SECTYPE, 1, BEAM, RECT, , 0

```

```

SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0,0,0,0,0,0,0
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/POST1
FINISH
/POST26
FINISH
/POST1
FINISH
/SOL
FINISH
/POST1
FINISH
/SOL
FINISH
/PREP7
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,S,_Y
!*
!*
CMSEL,S,_Y1
LATT,1, ,1, , , ,1
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1

```

```

!*
FLST,5,11,4,ORDE,2
FITEM,5,1
FITEM,5,-11
CM,_Y,LINE
LSEL,, , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,10, , , ,1
!*
FLST,2,11,4,ORDE,2
FITEM,2,1
FITEM,2,-11
LMESH,P51X
GPLOT
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LAST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,1.082226,1
/REP,FAST
!*
PRNSOL,U,COMP
/DIST, 1 ,1.082226,1
/REP,FAST

```

```

/DIST, 1 ,1.082226,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
/DIST, 1 ,0.924021,1
/REP,FAST
FINISH
/SOL
FINISH
/PREP7
/UI,BEAM,OFF
FINISH
/SOL
FINISH
/PREP7
!*
FINISH
/SOL
!*
ANTYPE,2
!*
!*
MODEOPT,LANB,10
EQLV,SPAR
MXPAND,0, , ,0
LUMPM,0
PSTRES,0
!*
MODEOPT,LANB,10,0,10000, ,OFF
/STATUS,SOLU
SOLVE
FINISH
/POST1
SET,LIST

```

```

SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/USER, 1
/FOC, 1, 4.61680535724 , 3.30150089379 , 0.841861639717E-01
/REPLO
!*
SET,LIST,999
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,LIST,999
!*

```

```

/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
SET,NEXT
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1

```

```

/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,,-1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST

```

```

SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
FINISH
/PREP7
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
SECTYPE, 1, BEAM, I, , 0
SECOFFSET, CENT
SECDATA,0.2,0.2,0.3,0.018,0.018,0.0106,0,0,0,0,0
FINISH
/SOL
!*
ANTYPE,0
/VIEW,1,,,1
/ANG,1
/REP,FAST
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
!*
PRNSOL,U,COMP

```

```
FINISH
/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
FINISH
/SOL
!*
ANTYPE,2
/STATUS,SOLU
SOLVE
FINISH
/POST1
!*
PRNSOL,U,COMP
SET,LIST
!*
PRNSOL,U,COMP
SET,FIRST
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
```

```
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
PLNSOL, U,SUM, 0,1.0
/VIEW,1,,,1
/ANG,1
/REP,FAST
SET,NEXT
!*
/EFACET,1
```



```

!*
FINISH
/PREP7
IGESOUT,'Apdl','txt','Desktop\','0
FINISH
!*
/PREP7
SECTYPE, 1, BEAM, RECT, , 0
SECOFFSET, CENT
SECDATA,0.1,0.1,0,0,0.018,0.0106,0,0,0,0,0
SAVE
SAVE
FINISH
/CLEAR,START
/COM,ANSYS RELEASE 2025 R2      BUILD 25.2   UP20250519   15:38:53
/input,start,ans,'C:\Program Files\ANSYS Inc\ANSYS Student\v252\ANSYS\apdl\
!*
/REPLOT,RESIZE
/PREP7
!*
ET,1,LINK180
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,EX,1,,200e9
MPDATA,PRXY,1,,0.3
N,1,,,,,,,,
N,2,,6.2837,,,,
N,3,2.3,3.9837,,,,
N,4,4.6,6.2837,,,,
N,5,6.8,3.9837,,,,
N,6,9.2,6.2837,,,,
N,7,9.2,,,,,

```

N,7,9.2,,,,,,
FLST,2,2,1
FITEM,2,1
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,1
FITEM,2,3
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,4
FITEM,2,2
E,P51X
FLST,2,2,1
FITEM,2,3
FITEM,2,5
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,6
E,P51X
FLST,2,2,1

```

FITEM,2,6
FITEM,2,4
E,P51X
FLST,2,2,1
FITEM,2,5
FITEM,2,7
E,P51X
FLST,2,2,1
FITEM,2,7
FITEM,2,6
E,P51X
FINISH
/SOL
FLST,2,1,1,ORDE,1
FITEM,2,1
!*
/GO
D,P51X,ALL, , , , , , , ,
FLST,2,1,1,ORDE,1
FITEM,2,7
!*
/GO
D,P51X,UY, , , , ,UZ, , , ,
FINISH
/POST1
FINISH
/SOL
FLST,2,1,1,ORDE,1
FITEM,2,2
!*
/GO
F,P51X,FY,-3800
FLST,2,1,1,ORDE,1
FITEM,2,4

```

```

!*
/GO
F,P51X,FY,-950
FLST,2,1,1,ORDE,1
FITEM,2,6
!*
/GO
F,P51X,FX,1900
/STATUS,SOLU
SOLVE
!*
ANTYPE,0
FINISH
/PREP7
!*
!*
MPTEMP,,,,,,,,
MPTEMP,1,0
MPDATA,DENS,1,,7850
FINISH
/SOL
/STATUS,SOLU
SOLVE
FINISH
/PREP7
/UI,BEAM,OFF
!*
!*
SECTYPE,1,LINK, ,rect
SECDATA,0.01,
SECCONTROL,0,0
!*
!*
!*

```

```
SECTYPE,1,LINK, ,rect
SECDATA,0.01,
SECCONTROL,0,0
!*
FINISH
/SOL
/STATUS,SOLU
SOLVE
```

DEĞERLEDİRME

Yapılan üç farklı analiz sonucunda, maksimum yer değıştirme değerlerinin birbirine oldukça yakın olduđu görölmüşür. Sistemin geometrik formu, eleman tipi değışiminden bağımsız olarak yüksek rijitlik sergilemektedir. Moment aktarımı kapasitesi olan Beam elemanları ile sadece eksenel kuvvet taşıyan Link elemanları arasındaki bu sayısal yakınlık, sistemin baskın olarak bir kafes kiriş gibi davrandığını ve modelin teorik kabullerle tam uyumlu olduğunu kanıtlamaktadır.