3. The solution of the nodal value is,

U1 = 0.00000E+00 /m	U2 = 0.00000E+00 /rad
U3 = 0.00000E+00 /m	U4 = -0.13021E-01 /rad
U5 = 0.28646E+00 /m	U6 = -0.33854E-01 /rad

The solutions match well with the hand calculation results.

Sample data and output:

```
   *** ECHO OF THE INPUT DATA STARTS ***

 Hw-6-1:
 3  0  0                    MODEL, NTYPE, ITEM
 0  2                       IELEM, NEM
 1  0                       ICONT, NPRNT
 0.0   10  10                  DX(I)
 0.0   0.0                    AX0,  AX1
 4.0E6   0.0                     BX0,  BX1
 0.0   0.0                    CX0, CX1
 500.0   0.0  0.0                FX0, FX1, FX2
 3                          NSPV
 1  1  0.0                   ISPV(1,1), ISPV(1,2), VSPV(1)
 1  2  0.0                   ISPV(2,1), ISPV(2,2), VSPV(2)
 2  1  0.0                   ISPV(3,1), ISPV(3,2), VSPV(3)
 0                          NSSV
 0                          NNBC
 0                          NMPC

   **** ECHO OF THE INPUT DATA ENDS ****
_____________________________________________________

     OUTPUT from program   FEM1D   by J N REDDY
 _____________________________________________________

Hw-6-1:

   *** ANALYSIS OF MODEL 3, AND TYPE 0 PROBLEM ***
         (see the code below)

   MODEL=1,NTYPE=0: A problem described by MODEL EQ. 1
   MODEL=1,NTYPE=1: A circular DISK (PLANE STRESS)
   MODEL=1,NTYPE>1: A circular DISK (PLANE STRAIN)
   MODEL=2,NTYPE=0: A Timoshenko BEAM (RIE) problem
   MODEL=2,NTYPE=1: A Timoshenko PLATE (RIE) problem
   MODEL=2,NTYPE=2: A Timoshenko BEAM (CIE) problem
   MODEL=2,NTYPE>2: A Timoshenko PLATE (CIE) problem
   MODEL=3,NTYPE=0: A Euler-Bernoulli BEAM problem
   MODEL=3,NTYPE>0: A Euler-Bernoulli Circular plate
   MODEL=4,NTYPE=0: A plane TRUSS problem
   MODEL=4,NTYPE=1: A Euler-Bernoulli FRAME problem
   MODEL=4,NTYPE=2: A Timoshenko (CIE) FRAME problem


      Element type (0, Hermite,>0, Lagrange)..=   0
      No. of deg. of freedom per node, NDF....=   2
```

```
    No. of elements in the mesh, NEM.....=   2
    No. of total DOF in the model, NEQ.....=   6
    Half bandwidth of matrix [GLK], NHBW ...=   4
    No. of specified primary DOF, NSPV.....=   3
    No. of specified secondary DOF, NSSV....=   0
    No. of specified Newton B. C.: NNBC.....=   0
    No. of speci. multi-pt. cond.: NMPC.....=   0

 Boundary information on primary variables:

    1   1   0.00000E+00
    1   2   0.00000E+00
    2   1   0.00000E+00

 Global coordinates of the nodes, {GLX}:

 0.00000E+00  0.10000E+02  0.20000E+02

 Coefficients of the differential equation:

    AX0 =  0.0000E+00    AX1 =  0.0000E+00
    BX0 =  0.4000E+07    BX1 =  0.0000E+00
    CX0 =  0.0000E+00    CX1 =  0.0000E+00


SOLUTION (values of PVs) at the NODES:

 0.00000E+00  0.00000E+00  0.00000E+00 -0.13021E-01  0.28646E+00
-0.33854E-01
_____________________________________________________________________________

 x is the global coord. if ICONT=1 and it is the local coord. if ICONT=0
     x       Deflect.     Rotation     B. Moment   Shear Force
_____________________________________________________________________________

 0.00000E+00  0.00000E+00  0.00000E+00  0.10417E+05 -0.31250E+04
 0.12500E+01 -0.17802E-02  0.26449E-02  0.65104E+04 -0.31250E+04
 0.25000E+01 -0.61035E-02  0.40690E-02  0.26042E+04 -0.31250E+04
 0.37500E+01 -0.11444E-01  0.42725E-02 -0.13021E+04 -0.31250E+04
 0.50000E+01 -0.16276E-01  0.32552E-02 -0.52083E+04 -0.31250E+04
 0.62500E+01 -0.19073E-01  0.10173E-02 -0.91146E+04 -0.31250E+04
 0.75000E+01 -0.18311E-01 -0.24414E-02 -0.13021E+05 -0.31250E+04
 0.87500E+01 -0.12461E-01 -0.71208E-02 -0.16927E+05 -0.31250E+04
 0.10000E+02  0.00000E+00 -0.13021E-01 -0.20833E+05 -0.31250E+04
 0.10000E+02  0.00000E+00 -0.13021E-01 -0.20833E+05  0.25000E+04
 0.11250E+02  0.20142E-01 -0.19043E-01 -0.17708E+05  0.25000E+04
 0.12500E+02  0.47201E-01 -0.24089E-01 -0.14583E+05  0.25000E+04
 0.13750E+02  0.79956E-01 -0.28158E-01 -0.11458E+05  0.25000E+04
 0.15000E+02  0.11719E+00 -0.31250E-01 -0.83333E+04  0.25000E+04
 0.16250E+02  0.15767E+00 -0.33366E-01 -0.52083E+04  0.25000E+04
 0.17500E+02  0.20020E+00 -0.34505E-01 -0.20833E+04  0.25000E+04
 0.18750E+02  0.24353E+00 -0.34668E-01  0.10417E+04  0.25000E+04
 0.20000E+02  0.28646E+00 -0.33854E-01  0.41667E+04  0.25000E+04
_____________________________________________________________________________

Stop - Program terminated.
```

4. The solution of the nodal value is,

U1 = 0.00000E+00	U2 = -0.19667E+05	U3 = 0.58667E+05	U4 = -0.46667E+04
U5 = 0.44000E+05	U6 = 0.10333E+05	U7 = 0.00000E+00	U8 = 0.46667E+04
U9 = 0.13333E+05	U10 = -0.60000E+04		

The solutions match well with the hand calculation results.

Sample data and output:

```
   *** ECHO OF THE INPUT DATA STARTS ***
Hw-6-1:
 3  0  0                    MODEL, NTYPE, ITEM
 0  4                       IELEM, NEM
 0  0                       ICONT, NPRNT
          5                                                                  NNM
          1          2          4.0                                          NOD(1,J),GLX(1)
          0.0   0.0                  AX0,  AX1
          1.0   0.0                  BX0,  BX1
          0.0   0.0                  CX0, CX1
          0.0   0.0  0.0               FX0, FX1, FX2
          2          3          4.0                                           NOD(2,J),GLX(2)
          0.0   0.0                   AX0,  AX1
          1.0   0.0                   BX0,  BX1
          0.0   0.0                   CX0, CX1
          0.0   0.0  0.0               FX0, FX1, FX2
          3          4          4.0                                          NOD(3,J),GLX(3)
          0.0   0.0                  AX0,  AX1
          1.0   0.0                  BX0,  BX1
          0.0   0.0                  CX0, CX1
          1000.0   0.0  0.0              FX0, FX1, FX2
          4          5          4.0                                           NOD(4,J),GLX(4)
          0.0   0.0                   AX0,  AX1
          1.0   0.0                   BX0,  BX1
          0.0   0.0                   CX0, CX1
          1000.0   0.0  0.0               FX0, FX1, FX2
 2                        NSPV
 1  1  0.0                  ISPV(1,1), ISPV(1,2), VSPV(1)
 4  1  0.0                  ISPV(2,1), ISPV(2,2), VSPV(2)
 2                        NSSV
 2  1  2500                   ISSV(1,1), ISSV(1,2), VSSV(1)
 2  2  2500                   ISSV(2,1), ISSV(2,2), VSSV(2)
 0                        NNBC
 0                        NMPC
  **** ECHO OF THE INPUT DATA ENDS ****
 ____________________________________________________________

     OUTPUT from program   FEM1D   by J N REDDY
 ____________________________________________________________
Hw-6-1:

  *** ANALYSIS OF MODEL 3, AND TYPE 0 PROBLEM ***
         (see the code below)

  MODEL=1,NTYPE=0: A problem described by MODEL EQ. 1
  MODEL=1,NTYPE=1: A circular DISK (PLANE STRESS)
```

```
 MODEL=1,NTYPE>1: A circular DISK (PLANE STRAIN)
 MODEL=2,NTYPE=0: A Timoshenko BEAM (RIE) problem
 MODEL=2,NTYPE=1: A Timoshenko PLATE (RIE) problem
 MODEL=2,NTYPE=2: A Timoshenko BEAM (CIE) problem
 MODEL=2,NTYPE>2: A Timoshenko PLATE (CIE) problem
 MODEL=3,NTYPE=0: A Euler-Bernoulli BEAM problem
 MODEL=3,NTYPE>0: A Euler-Bernoulli Circular plate
 MODEL=4,NTYPE=0: A plane TRUSS problem
 MODEL=4,NTYPE=1: A Euler-Bernoulli FRAME problem
 MODEL=4,NTYPE=2: A Timoshenko (CIE) FRAME problem

    Element type (0, Hermite,>0, Lagrange)..=   0
    No. of deg. of freedom per node, NDF....=   2
    No. of elements in the mesh, NEM........=   4
    No. of total DOF in the model, NEQ......=  10
    Half bandwidth of matrix [GLK], NHBW ...=   4
    No. of specified primary DOF, NSPV......=   2
    No. of specified secondary DOF, NSSV....=   2
    No. of specified Newton B. C.: NNBC.....=   0
    No. of speci. multi-pt. cond.: NMPC.....=   0

Boundary information on primary variables:

    1   1    0.00000E+00
    4   1    0.00000E+00

Boundary information on secondary variables:

    2   1    0.25000E+04
    2   2    0.25000E+04

 Properties of Element =  1

    Element length, H ..... =  0.4000E+01
    AX0 =  0.0000E+00    AX1 =  0.0000E+00
    BX0 =  0.1000E+01    BX1 =  0.0000E+00
    CX0 =  0.0000E+00    CX1 =  0.0000E+00
    FX0 =  0.0000E+00    FX1 =  0.0000E+00    FX2 =  0.0000E+00


 Properties of Element =  2

    Element length, H ..... =  0.4000E+01
    AX0 =  0.0000E+00    AX1 =  0.0000E+00
    BX0 =  0.1000E+01    BX1 =  0.0000E+00
    CX0 =  0.0000E+00    CX1 =  0.0000E+00
    FX0 =  0.0000E+00    FX1 =  0.0000E+00    FX2 =  0.0000E+00


 Properties of Element =  3

    Element length, H ..... =  0.4000E+01
    AX0 =  0.0000E+00    AX1 =  0.0000E+00
    BX0 =  0.1000E+01    BX1 =  0.0000E+00
    CX0 =  0.0000E+00    CX1 =  0.0000E+00
    FX0 =  0.1000E+04    FX1 =  0.0000E+00    FX2 =  0.0000E+00
```

Properties of Element = 4

Element length, H ..... = 0.4000E+01
AX0 = 0.0000E+00 AX1 = 0.0000E+00
BX0 = 0.1000E+01 BX1 = 0.0000E+00
CX0 = 0.0000E+00 CX1 = 0.0000E+00
FX0 = 0.1000E+04 FX1 = 0.0000E+00 FX2 = 0.0000E+00

SOLUTION (values of PVs) at the NODES:

0.00000E+00 -0.19667E+05 0.58667E+05 -0.46667E+04 0.44000E+05
0.10333E+05 0.00000E+00 0.46667E+04 0.13333E+05 -0.60000E+04

---

x is the global coord. if ICONT=1 and it is the local coord. if ICONT=0

x	Deflect.	Rotation	B. Moment	Shear Force
0.00000E+00	0.00000E+00	-0.19667E+05	0.56155E-05	0.18750E+04
0.50000E+00	0.97943E+04	-0.19432E+05	0.93750E+03	0.18750E+04
0.10000E+01	0.19354E+05	-0.18729E+05	0.18750E+04	0.18750E+04
0.15000E+01	0.28445E+05	-0.17557E+05	0.28125E+04	0.18750E+04
0.20000E+01	0.36833E+05	-0.15917E+05	0.37500E+04	0.18750E+04
0.25000E+01	0.44284E+05	-0.13807E+05	0.46875E+04	0.18750E+04
0.30000E+01	0.50562E+05	-0.11229E+05	0.56250E+04	0.18750E+04
0.35000E+01	0.55435E+05	-0.81823E+04	0.65625E+04	0.18750E+04
0.40000E+01	0.58667E+05	-0.46667E+04	0.75000E+04	0.18750E+04
0.00000E+00	0.58667E+05	-0.46667E+04	0.50000E+04	-0.62500E+03
0.50000E+00	0.60388E+05	-0.22448E+04	0.46875E+04	-0.62500E+03
0.10000E+01	0.60937E+05	0.20833E+02	0.43750E+04	-0.62500E+03
0.15000E+01	0.60393E+05	0.21302E+04	0.40625E+04	-0.62500E+03
0.20000E+01	0.58833E+05	0.40833E+04	0.37500E+04	-0.62500E+03
0.25000E+01	0.56336E+05	0.58802E+04	0.34375E+04	-0.62500E+03
0.30000E+01	0.52979E+05	0.75208E+04	0.31250E+04	-0.62500E+03
0.35000E+01	0.48841E+05	0.90052E+04	0.28125E+04	-0.62500E+03
0.40000E+01	0.44000E+05	0.10333E+05	0.25000E+04	-0.62500E+03
0.00000E+00	0.44000E+05	0.10333E+05	0.38333E+04	-0.26250E+04
0.50000E+00	0.38409E+05	0.11922E+05	0.25208E+04	-0.26250E+04
0.10000E+01	0.32187E+05	0.12854E+05	0.12083E+04	-0.26250E+04
0.15000E+01	0.25664E+05	0.13130E+05	-0.10417E+03	-0.26250E+04
0.20000E+01	0.19167E+05	0.12750E+05	-0.14167E+04	-0.26250E+04
0.25000E+01	0.13023E+05	0.11714E+05	-0.27292E+04	-0.26250E+04
0.30000E+01	0.75625E+04	0.10021E+05	-0.40417E+04	-0.26250E+04
0.35000E+01	0.31120E+04	0.76719E+04	-0.53542E+04	-0.26250E+04
0.40000E+01	0.00000E+00	0.46667E+04	-0.66667E+04	-0.26250E+04
0.00000E+00	0.00000E+00	0.46667E+04	-0.66667E+04	0.20000E+04
0.50000E+00	-0.15417E+04	0.15833E+04	-0.56667E+04	0.20000E+04
0.10000E+01	-0.16667E+04	-0.10000E+04	-0.46667E+04	0.20000E+04
0.15000E+01	-0.62500E+03	-0.30833E+04	-0.36667E+04	0.20000E+04
0.20000E+01	0.13333E+04	-0.46667E+04	-0.26667E+04	0.20000E+04
0.25000E+01	0.39583E+04	-0.57500E+04	-0.16667E+04	0.20000E+04
0.30000E+01	0.70000E+04	-0.63333E+04	-0.66667E+03	0.20000E+04
0.35000E+01	0.10208E+05	-0.64167E+04	0.33333E+03	0.20000E+04
0.40000E+01	0.13333E+05	-0.60000E+04	0.13333E+04	0.20000E+04

Stop - Program terminated.