



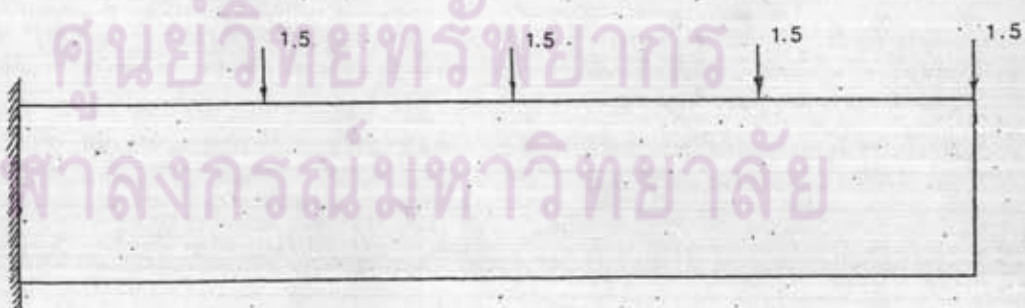
บทที่ 7

ตัวอย่างการใช้งาน

ในการแสดงการใช้งานโปรแกรมนี้ได้แบ่งออกเป็น 5 ตัวอย่าง ซึ่งเป็นการใช้งานโปรแกรมอินเทอร์เฟซของ"แชฟ 4"

ตัวอย่างต่อไปนี้จะเริ่มสร้างข้อมูลภายในโปรแกรม"พาทรน"เลย เนื่องจากการใช้"2ดี อินเทอร์เฟซ" หรือ "3ดี อินเทอร์เฟซ" แปลงข้อมูลจาก"เมดูซา"มายัง"พาทรน"เป็นขั้นตอนที่ง่ายเพราะ โปรแกรมจะแปลงข้อมูลรูปภาพให้เป็นคำสั่งสำหรับ"พาทรน"โดยอัตโนมัติ ซึ่งหลังจากที่ใช้"2ดี อินเทอร์เฟซ" หรือ "3ดี อินเทอร์เฟซ"แล้ว ยังคงต้องมาสร้างข้อมูลเพิ่มเติมภายใน"พาทรน"อีก เพื่อให้ได้ข้อมูลที่สมบูรณ์สำหรับการวิเคราะห์

ตัวอย่างที่ 7.1 การวิเคราะห์ CANTILEVER BEAM ที่มีขนาด 6X1X1 เมตร และรับภาระแบบสเททิก ดังรูป



รูปทางโครงสร้าง

ซึ่งในที่นี้จะพิจารณาโดยคิดเป็น PLANE STRESS และใช้แบ่งโครงสร้างออกคร่าวๆ เป็น 4 เอเลเมนต์แบบรูปร่างสี่เหลี่ยมใน 2 มิติแบบเพลนสเตรส ซึ่งมีค่า

$$E_n = 2.0E5 \text{ N/m}^2 \quad E_m = 2.1E5 \text{ N/m}^2 \quad E_t = 2.2E5 \text{ N/m}^2$$

$$\nu_n = 0.3 \quad \nu_m = 0.27 \quad \nu_t = 0.25$$

$$G_n = 7.69E3 \text{ N/m}^2 \quad G_m = 7.69E3 \text{ N/m}^2 \quad G_t = 8E3 \text{ N/m}^2$$

และมีความหนาแน่นเชิงมวล 2 Kg/m^3



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7.1.1 สร้างข้อมูลใน"พาแตรน"

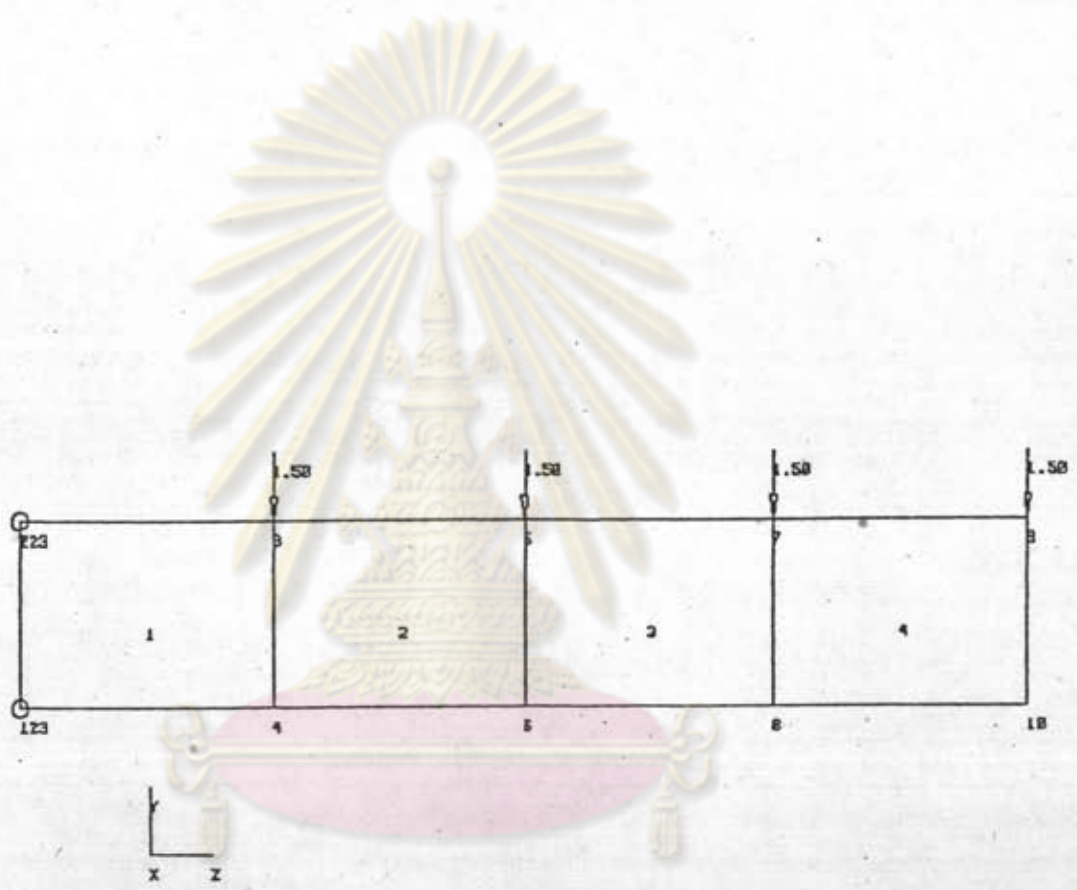
```

GO
1
GR,1,,0/0
GR,2,,0/0/6
GR,3,,0/1/6
GR,4,,/1
VIEW
1
,90
PL
PA,1,QUAD,,1/2/3/4
SET,LINE,0
SET,CPLOT,ON
GF,P1,,2/5
CF,P1,QUAD/4/3
SET,LAB1,OFF
EQUIV
N
2
1
PL
DISP,N1/N2,ADD
1
0,0,0
0,0,0
DF,P1,FOR,-1.5,1,N4/N6/N8/N10
PMAT,1,ORT,2R5,2.1R5,2.2R5,.3,.25,.27,,7.69R3,8R3,
7.69R3,5(0)
PF,P1,QUAD/4/3,1/0/1/0/2
OPT
3
3
2
NEU
1
1
THIS IS THE ABRAM FOR SAP IV.
Y
Y
STOP

```

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รูปทางไฟไนต์เอเลเมนต์

7.1.2 แฟ้มกลางที่ได้

```

25      0      0      1      0      0      0      0      0
THIS IS THE ABRAM FOR SAP IV.
26      0      0      1     10      4      1      1      0
30-MAR-89  13:05:21  2.1
1       1       0       2       0       0       0       0       0
0.000000000E+00 0.000000000E+00 0.000000000E+00
1G      6       0       0 000000
1       2       0       2       0       0       0       0       0
0.000000000E+00 0.100000000E+01 0.000000000E+00
1G      6       0       0 000000
1       3       0       2       0       0       0       0       0
0.000000000E+00 0.100000000E+01 0.150000000E+01
1G      6       0       0 000000
1       4       0       2       0       0       0       0       0
0.000000000E+00 0.000000000E+00 0.150000000E+01
1G      6       0       0 000000
1       5       0       2       0       0       0       0       0
0.000000000E+00 0.100000000E+01 0.300000000E+01
1G      6       0       0 000000
1       6       0       2       0       0       0       0       0
0.000000000E+00 0.000000000E+00 0.300000000E+01
1G      6       0       0 000000
1       7       0       2       0       0       0       0       0
0.000000000E+00 0.100000000E+01 0.450000000E+01
1G      6       0       0 000000
1       8       0       2       0       0       0       0       0
0.000000000E+00 0.000000000E+00 0.450000000E+01
1G      6       0       0 000000
1       9       0       2       0       0       0       0       0
0.000000000E+00 0.100000000E+01 0.600000000E+01
1G      6       0       0 000000
1      10       0       2       0       0       0       0       0
0.000000000E+00 0.000000000E+00 0.600000000E+01
1G      6       0       0 000000
2       1       4       2       0       0       0       0       0
4       3       1       0 0.000000000E+00 0.000000000E+00 0.000000000E+00
1       2       3       4       0       0       0       0       0
2       2       4       2       0       0       0       0       0
4       3       1       0 0.000000000E+00 0.000000000E+00 0.000000000E+00
4       3       5       6
2       3       4       2       0       0       0       0       0
4       3       1       0 0.000000000E+00 0.000000000E+00 0.000000000E+00
6       5       7       8
2       4       4       2       0       0       0       0       0
4       3       1       0 0.000000000E+00 0.000000000E+00 0.000000000E+00
8       7       9      10

```


43	2	4	9	1	0	0	0	0	0	0	0
	1	2	2	1	0	0	0	0	0	0	0
	0	0	G	6	0	0	0	0	0	5	0
	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.
	0	0	0	0	0	0	0	0	0	0	4
	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-4	0
	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-3	0
	0.	0000000000E+00	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-6	0
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-5	0
43	3	4	9	1	0	0	0	0	0	0	0
	1	2	2	1	0	0	0	0	0	0	0
	0	0	G	6	0	0	0	0	0	5	0
	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.
	0	0	0	0	0	0	0	0	0	0	4
	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-6	0
	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-5	0
	0.	0000000000E+00	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-8	0
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-7	0
43	4	4	9	1	0	0	0	0	0	0	0
	1	2	2	1	0	0	0	0	0	0	0
	0	0	G	6	0	0	0	0	0	5	0
	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.
	0	0	0	0	0	0	0	0	0	0	4
	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-8	0
	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	0000000000E+00	0.	-7	0
	0.	0000000000E+00	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-10	0
	0.	1000000000E+01	0.	1000000000E+01	0.	0000000000E+00	0.	0000000000E+00	0.	-9	0
45	1	1	3	0	0	0	0	0	0	0	0
	3	1	4	0	1	1	0	0	0	0	0
	5	4	4	3	3	1	0	0	0	0	0
	1	2	4	3	-1	0	0	0	0	0	0
45	2	1	3	0	0	0	0	0	0	0	0
	3	2	4	0	2	2	0	0	0	0	0
	5	4	4	3	3	2	0	0	0	0	0
	1	2	4	3	-2	0	0	0	0	0	0
45	3	1	3	0	0	0	0	0	0	0	0
	3	3	4	0	3	3	0	0	0	0	0
	5	4	4	3	3	3	0	0	0	0	0
	1	2	4	3	-3	0	0	0	0	0	0
45	4	1	3	0	0	0	0	0	0	0	0
	3	4	4	0	4	4	0	0	0	0	0
	5	4	4	3	3	4	0	0	0	0	0
	1	2	4	3	-4	0	0	0	0	0	0
99	0	0	1	0	0	0	0	0	0	0	0

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และเมื่อ RUN ด้วย "CPL PSP ABEAM 0 1" แล้ว จะได้

7.1.3 แฟ้มประเภท COMO ที่ได้

```

INPUT (NEUTRAL) FILE : SABEAM.DEF
OUTPUT FILE (___ .DAT) : SABEAM.DAT
STATIC (0) OR DYNAMIC (1) ANALYSIS
0
** PROCESSING NODE **
** PROCESSING ELEMENT **
ELEMENT NO.      SHAPE CODE  VAR. CODE
    1              4             0
    2              4             0
    3              4             0
    4              4             0

** PROCESSING MATERIAL PROPERTY **
** PROCESSING ELEMENT PROPERTY **
** PROCESSING NODE FORCE **
** PROCESSING NODE DISPLACEMENT **
READING IS COMPLETE, NOW IN WRITING PROCESS

/ 2-D QUAD. /
/ CONCENTRATED LOAD /

**** STOP

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7.1.4 แฟ้มข้อมูลเข้าสำหรับ"เซฟ 4"ที่ได้

THIS IS THE ABRAM FOR SAP IV.

10	1	1	0	0	0	0	0.000	0.000	0.000	0.000
1	1	1	1	0	0	0	0.000	1.000	0.000	0.000
2	1	1	1	0	0	0	0.000	1.000	1.500	0.000
3	0	0	0	0	0	0	0.000	0.000	1.500	0.000
4	0	0	0	0	0	0	0.000	1.000	3.000	0.000
5	0	0	0	0	0	0	0.000	0.000	3.000	0.000
6	0	0	0	0	0	0	0.000	1.000	4.500	0.000
7	0	0	0	0	0	0	0.000	0.000	4.500	0.000
8	0	0	0	0	0	0	0.000	1.000	6.000	0.000
9	0	0	0	0	0	0	0.000	0.000	6.000	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0.000

4	4	1	1	2
1	0.000E+00	0.200E+01	0.000E+00	
	0.000	0.200E+06	0.210E+06	0.220E+06
	0.300E+00	0.270E+00	0.250E+00	0.769E+05
0.000E+00	0.000E+00	0.000E+00		

1.000	1.000	1.000	1.000	1.000
1.000	1.000	1.000	1.000	1.000
1.000	1.000	1.000	1.000	1.000
1.000	1.000	1.000	1.000	1.000

1	1	2	3	4	1	0.000E+00	0.000E+00	0	0.100E+01
2	4	3	5	6	1	0.000E+00	0.000E+00	0	0.100E+01
3	6	5	7	8	1	0.000E+00	0.000E+00	0	0.100E+01
4	8	7	9	10	1	0.000E+00	0.000E+00	0	0.100E+01
3	1	0.000E+00	-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	1	0.000E+00	-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	1	0.000E+00	-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	1	0.000E+00	-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

1.000	0.000	0.000	0.000
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7.1.5 เพิ่มผลลัพธ์จาก"เซพ 4"ที่ได้

OK, SAP4

If the ERROR occurred during an execution program SAP4.
Please attach to SAP4TEMP directory and delete the temporary files.

INPUT DATA FILE NAME ABEAM.DAT
THIS IS THE ABEAM FOR SAP IV.

CONTROL INFORMATION

NUMBER OF NODAL POINTS = 10
 NUMBER OF ELEMENT TYPES = 1
 NUMBER OF LOAD CASES = 1
 NUMBER OF FREQUENCIES = 0
 ANALYSIS CODE (NDYN) = 0
 EQ.0, STATIC
 EQ.1, MODAL EXTRACTION
 EQ.2, FORCED RESPONSE
 EQ.3, RESPONSE SPECTRUM
 EQ.4, DIRECT INTEGRATION
 SOLUTION MODE (MODEX) = 0
 EQ.0, EXECUTION
 EQ.1, DATA CHECK
 NUMBER OF SUBSPACE
 ITERATION VECTORS (NAD) = 0
 EQUATIONS PER BLOCK = 0
 TAPE10 SAVE FLAG (N10SV) = 0

NODAL POINT INPUT DATA							NODAL POINT COORDINATES				
ONODE	BOUNDARY CONDITION CODES						X	Y	Z	T	
NUMBER	X	Y	Z	XX	YY	ZZ	X	Y	Z	T	
1	1	1	1	0	0	0	0.000	0.000	0.000	0	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0	0.000

IGENERATED NODAL DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	T
1	1	1	1	0	0	0	0.000	0.000	0.000	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0.000

1EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	0	1	2	3
2	0	0	0	4	5	6
3	7	8	9	10	11	12
4	13	14	15	16	17	18
5	19	20	21	22	23	24
6	25	26	27	28	29	30
7	31	32	33	34	35	36
8	37	38	39	40	41	42
9	43	44	45	46	47	48
10	49	50	51	52	53	54

1PLANE STRESS ANALYSIS

NUMBER OF ELEMENTS = 4
 NUMBER OF MATERIALS = 1
 MAXIMUM TEMPERATURES
 PER MATERIAL = 1
 ANALYSIS CODE = 2
 CODE FOR INCLUSION
 OF BENDING MODES = 0
 EQ. 0, INCLUDE
 GT. 0, SUPPRESS



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MATERIAL I. D. NUMBER = 1
 NUMBER OF TEMPERATURES = 1
 WEIGHT DENSITY = 0.0000E+00
 MASS DENSITY = 0.2000E+01
 BETA ANGLE = 0.000

TEMPERATURE	E(N)	E(S)	E(T)	NU(NS)	NU(NT)	NU(ST)	G(NS)	ALPHA(N)	ALPHA(S)	ALPHA(T)
0.00	0.2000E+06	0.2100E+06	0.2200E+06	0.3000	0.2700	0.2500	0.7590E+05	0.0000E+00	0.0000E+00	0.0000E+00

ELEMENT LOAD MULTIPLIERS

LOAD CASE TEMPERATURE PRESSURE X-GRAVITY Y-GRAVITY Z-GRAVITY

A	1.000	1.000	1.000	1.000	1.000
B	1.000	1.000	1.000	1.000	1.000
C	1.000	1.000	1.000	1.000	1.000
D	1.000	1.000	1.000	1.000	1.000

ELEMENT NUMBER	MATL			L TYPE	REFERENCE TEMPERATURE	I-J FACE PRESSURE	STRESS OPTION	KG	THICKNESS	
	I	J	K							
1	1	2	3	4	1	0.000	0.000E+00	4	1	1.0000
2	4	3	5	6	1	0.000	0.000E+00	4	1	1.0000
3	6	5	7	8	1	0.000	0.000E+00	4	1	1.0000
4	8	7	9	10	1	0.000	0.000E+00	4	1	1.0000

EQUATION PARAMETERS

TOTAL NUMBER OF EQUATIONS = 54
 BANDWIDTH = 20
 NUMBER OF EQUATIONS IN A BLOCK = 54
 NUMBER OF BLOCKS = 1

MODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
3	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
5	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
9	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

STRUCTURE LOAD CASE ELEMENT LOAD MULTIPLIERS

LOAD CASE	A	B	C	D
1	1.000	0.000	0.000	0.000

NODE DISPLACEMENTS / ROTATIONS

NODE NUMBER	LOAD CASE	X-TRANSLATION	Y-TRANSLATION	Z-TRANSLATION	X-ROTATION	Y-ROTATION	Z-ROTATION
0	10	0.00000E+00	-0.12584E-01	-0.14419E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	9	0.00000E+00	-0.12591E-01	0.14509E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	8	0.00000E+00	-0.82903E-02	-0.13955E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	7	0.00000E+00	-0.82917E-02	0.14010E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	6	0.00000E+00	-0.43258E-02	-0.12035E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	5	0.00000E+00	-0.43284E-02	0.12072E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	4	0.00000E+00	-0.12726E-02	-0.77077E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	3	0.00000E+00	-0.12757E-02	0.77209E-03	0.00000E+00	0.00000E+00	0.00000E+00

```

0 2 1 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0 1 1 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

```

TWO-DIMENSIONAL FINITE ELEMENTS

1. CENTROID STRESSES REFERENCED TO LOCAL Y-Z COORDINATES.
2. MID-SIDE STRESSES ARE NORMAL AND PARALLEL TO ELEMENT EDGES.

ELEMENT (1)

LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE
1 CEN	-0.30928E+00	-0.54570E-11	0.00000E+00	-0.60000E+01	0.58474E+01	-0.61566E+01	-45.74

ELEMENT (2)

LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE
1 CEN	-0.57216E+00	-0.63665E-11	0.00000E+00	-0.45000E+01	0.42230E+01	-0.47952E+01	-46.82

ELEMENT (3)

LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE
1 CEN	-0.40206E+00	-0.12733E-10	0.00000E+00	-0.30000E+01	0.28057E+01	-0.32078E+01	-46.92

ELEMENT (4)

LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE
1 CEN	-0.81959E+00	-0.23647E-10	0.00000E+00	-0.15000E+01	0.11452E+01	-0.19648E+01	-52.64

STATIC SOLUTION TIME LOG

```

EQUATION SOLUTION = 0.20
DISPLACEMENT OUTPUT = 0.15
STRESS RECOVERY = 0.18

```

OVERALL TIME LOG

```

NODAL POINT INPUT = 0.45
ELEMENT STIFFNESS FORMATION = 0.47
NODAL LOAD INPUT = 0.12
TOTAL STIFFNESS FORMATION = 0.16
STATIC ANALYSIS = 0.55
EIGENVALUE EXTRACTION = 0.00
FORCED RESPONSE ANALYSIS = 0.00
RESPONSE SPECTRUM ANALYSIS = 0.00
STEP-BY-STEP INTEGRATION = 0.00

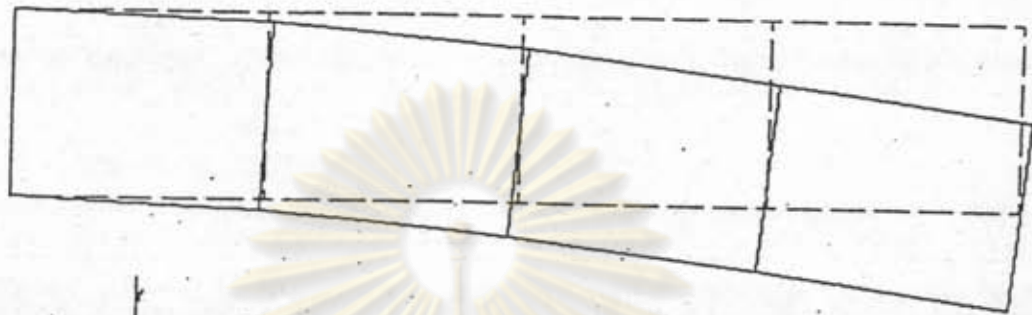
TOTAL SOLUTION TIME = 1.75

```

**** STOP



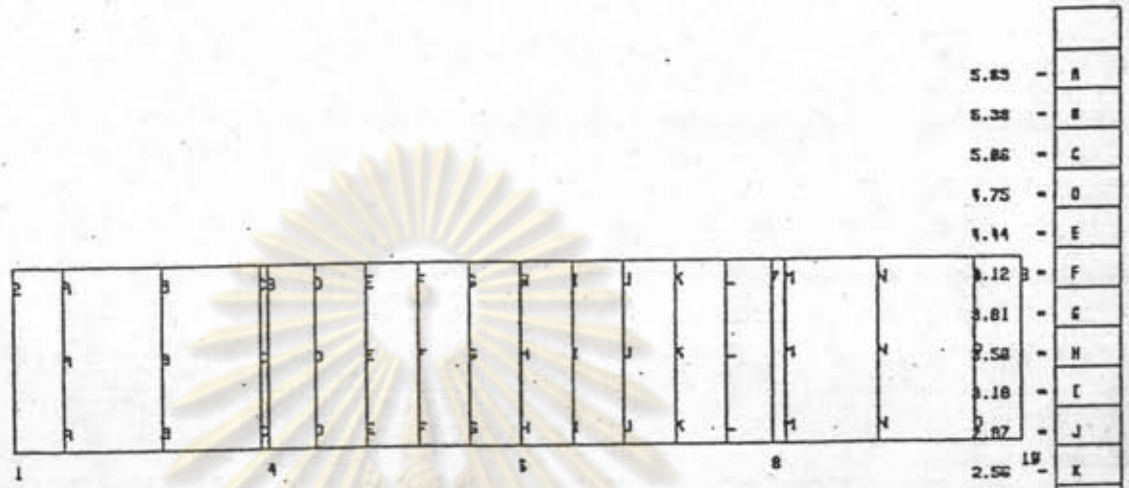
7.1.6 รูปและแผนผังการจัดที่ได้



X Z
 1THIS IS THE ABEAM FOR SAP IV.
 COLS 1-X DISP., 2-Y DISP., 3-Z DISP., 4-X ROT., 5-Y ROT., 6-Z ROT.
 LOAD CASE NO. 1

1THIS IS THE ABEAM FOR SAP IV.
 10 10 0.145090E-02 9 6
 COLS 1-X DISP., 2-Y DISP., 3-Z DISP., 4-X ROT., 5-Y ROT., 6-Z ROT.
 LOAD CASE NO. 1
 10.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
 0.0000000E+00
 20.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
 0.0000000E+00
 30.0000000E+00-.1275700E-02-.7720900E-030.0000000E+00.0000000E+00
 0.0000000E+00
 40.0000000E+00-.1272600E-02-.7707700E-030.0000000E+00.0000000E+00
 0.0000000E+00
 50.0000000E+00-.4328400E-020.1207200E-020.0000000E+00.0000000E+00
 0.0000000E+00
 60.0000000E+00-.4325800E-02-.1203500E-020.0000000E+00.0000000E+00
 0.0000000E+00
 70.0000000E+00-.8291701E-020.1401000E-020.0000000E+00.0000000E+00
 0.0000000E+00
 80.0000000E+00-.8290300E-02-.1395500E-020.0000000E+00.0000000E+00
 0.0000000E+00
 90.0000000E+00-.1259100E-010.1450900E-020.0000000E+00.0000000E+00
 0.0000000E+00
 100.0000000E+00-.1258400E-01-.1441900E-020.0000000E+00.0000000E+00
 0.0000000E+00

7.1.7 รูปและแน้มผลลัพธ์ที่เอเลเมนต์ที่ได้



THIS IS THE ABEAM FOR SAP IV.
 COLS 1-S11, 2-S22, 3-S33, 4-S12, 5-Smax, 6-Smin
 LOAD CASE NO. 1

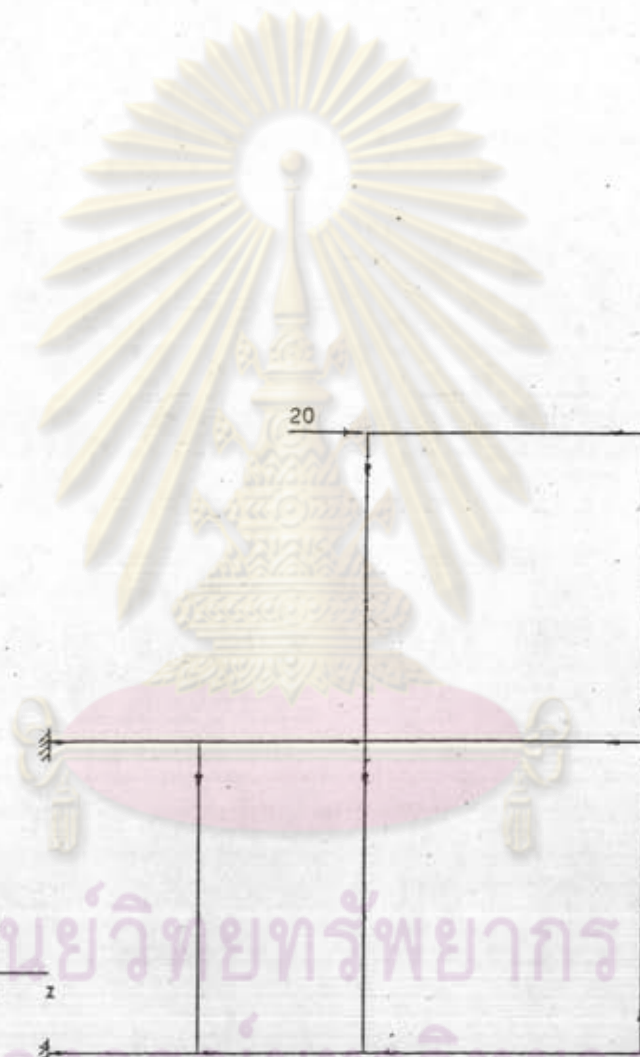
เมื่อพิจารณาค่าในคอลัมน์ความเค้นสูงสุด

THIS IS THE ABEAM FOR SAP IV.

6
 COLS 1-S11, 2-S22, 3-S33, 4-S12, 5-Smax, 6-Smin
 LOAD CASE NO. 1

1	4	- .3092800E+00	- .5457000E-110	.0000000E+00	- .6000000E+010	.5847400E+01	- .6156600E+01
2	4	- .5721600E+00	- .6366500E-110	.0000000E+00	- .4500000E+010	.4223000E+01	- .4795200E+01
3	4	- .4020600E+00	- .1273300E-100	.0000000E+00	- .3000000E+010	.2805700E+01	- .3207800E+01
4	4	- .8195900E+00	- .2364700E-100	.0000000E+00	- .1500000E+010	.1145200E+01	- .1964800E+01

ตัวอย่างที่ 7.2 เป็นตัวอย่างที่สมมติขึ้นเพื่อแสดงการใช้เอเลเมนต์มากกว่า 1 ชนิด
 ร่วมกัน คือ บีม และ รูปร่างสี่เหลี่ยมใน 2 มิติแบบเพลนสเทรล ซึ่งรับภาระสถิตย์ ดังรูป



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และมีคุณสมบัติดังนี้

แบบบีม มีค่า $A_1 = 34 \text{ m}^2$ $A_2 = 23 \text{ m}^2$ $A_3 = 23 \text{ m}^2$
 $J_1 = 40 \text{ m}^4$ $I_2 = 35 \text{ m}^4$ $I_3 = 35 \text{ m}^4$
 $E = 205 \text{ E}6 \text{ N/m}^2$ $\nu = 0.3$
 และ ความหนาแน่นเชิงมวล = 0.007 Kg/m

แบบเพลนสเทรล มีค่า

$E_n = 1 \text{ E}7 \text{ N/m}^2$ $E_u = 1.1 \text{ E}7 \text{ N/m}^2$ $E_c = 1.2 \text{ E}8 \text{ N/m}^2$
 $\nu_{nn} = 0.3$ $\nu_{uu} = 0.27$ $\nu_{uc} = 0.25$
 $G_{nn} = 2.5 \text{ E}6 \text{ N/m}^2$ $G_{uu} = 2.5 \text{ E}6 \text{ N/m}^2$ $G_{uc} = 3 \text{ E}6 \text{ N/m}^2$
 $\alpha_n = 1 \text{ E}-2 / ^\circ\text{C}$ $\alpha_u = 1 \text{ E}-2 / ^\circ\text{C}$ $\alpha_c = 1.1 \text{ E}-2 / ^\circ\text{C}$

และมีความหนาแน่นเชิงมวล 2 Kg/m^3

ความหนาแน่นเชิงน้ำหนัก $0.1 \text{ E}-4 \text{ N/m}^3$

ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย

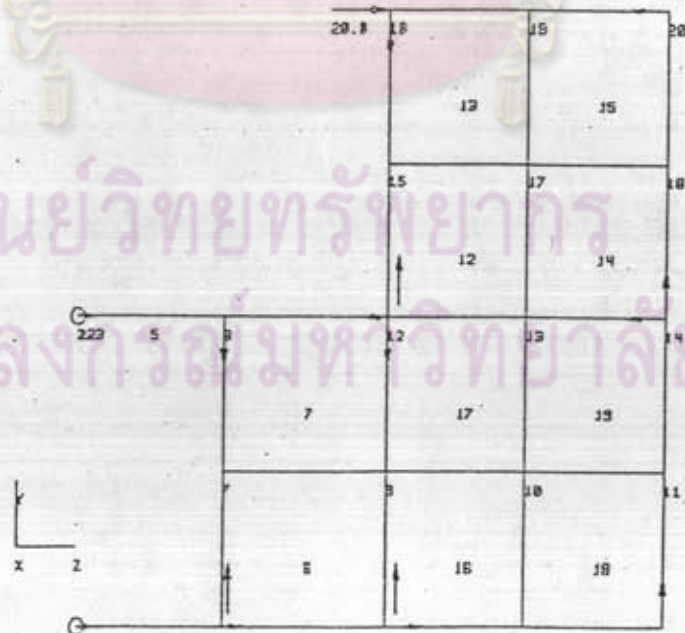
7.2.1 สร้างข้อมูลใน"พาแทรน"

GO
 1
 GR,1,,7.599/-52.809/-60
 GR,2,,7.599/-52.809/-32.802
 GR,3,,7.599/-52.809/-2.802
 GR,4,,7.599/-52.809/47.198
 GR,5,,7.599/-2.809/-60
 GR,6,,7.599/-2.809/-32.802
 GR,7,,7.599/-2.809/-2.802
 GR,8,,7.599/-2.809/47.198
 GR,9,,7.599/47.191/-2.802
 GR,10,,7.599/47.191/47.198
 VIEW
 1
 ,90
 PL
 LI,1/2,2G,,1/5,2/6
 PA,1T3,QUAD,,2/3/7/6/3/4/8/7/7/8/10/9
 SET,LINE,0
 SET,CPLOT,ON
 PL
 GF,1L/2L,,2
 GF,P1,,3/2
 GF,P2/3,,3/3
 SET,LAB1,OFF
 CF,1L/2L,BAR/2/2
 1
 G
 9
 4
 CF,P1T3,QUAD/4/3
 EQUIV
 N

สมัยวิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย

```

2
1
7
DISP,N1/3,ADD
1
0,0,0
GO
DISP,N2/4,ADD
0,,0,0,0
GO
DF,P3,FOR, //20,1,N22
PMAT,1,ISO,205E6,,.3
PMAT,2,ORT,1E7,1.1E7,1.2E7,.3,.25,.27,,2.5E6,3E6,
2.5E6,1E-2,1E-2,1.1E-2,68.5
PL
PF,1L/2L,BAR/2/2,1/34/23/23/40/2(35)/.007
PF,P1T3,QUAD/4/3,2/0/.2/30/2
OPT
3
3
2
NEU
1
1
THIS IS THE BEAMS AND PLANE STRESSES FOR SAP IV.
N
STOP
    
```



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

รูปทางไฟไนต์เอลิเมนต์

7.2.2 แฟ้มกลางที่ได้

25 0 0 1 0 0 0 0 0
 THIS IS THE BEAMS AND PLANK STRESSES FOR SAP IV.
 26 0 0 1 20 12 2 2 0
 02-MAY-89 17:45:34 2.1
 1 1 0 2 0 0 0 0 0
 0.759924984E+01-0.528094024E+02-0.600000000E+02
 1G 6 0 0 000000
 1 2 0 2 0 0 0 0 0
 0.759924984E+01-0.280946016E+01-0.600000000E+02
 1G 6 0 0 000000
 1 3 0 2 0 0 0 0 0
 0.759924889E+01-0.528094101E+02-0.328024139E+02
 1G 6 0 0 000000
 1 4 0 2 0 0 0 0 0
 0.759924889E+01-0.528093872E+02-0.280240583E+01
 1G 6 0 103 000000
 1 5 0 2 0 0 0 0 0
 0.759924889E+01-0.528093872E+02 0.221975860E+02
 1G 6 0 103 000000
 1 6 0 2 0 0 0 0 0
 0.759924889E+01-0.528093795E+02 0.471975708E+02
 1G 6 0 103 000000
 1 7 0 2 0 0 0 0 0
 0.759924889E+01-0.278094368E+02-0.328024139E+02
 1G 6 0 0 000000
 1 8 0 2 0 0 0 0 0
 0.759924889E+01-0.280945778E+01-0.328024292E+02
 1G 6 0 0 000000
 1 9 0 2 0 0 0 0 0
 0.759924889E+01-0.278094139E+02-0.280241871E+01
 1G 6 0 103 000000
 1 10 0 2 0 0 0 0 0
 0.759924889E+01-0.278094177E+02 0.221975746E+02
 1G 6 0 103 000000
 1 11 0 2 0 0 0 0 0
 0.759924889E+01-0.278094024E+02 0.471975632E+02
 1G 6 0 103 000000
 1 12 0 2 0 0 0 0 0
 0.759924889E+01-0.280945301E+01-0.280242491E+01
 1G 6 0 103 000000
 1 13 0 2 0 0 0 0 0
 0.759924889E+01-0.280943775E+01 0.221975670E+02
 1G 6 0 103 000000
 1 14 0 2 0 0 0 0 0
 0.759924889E+01-0.280943441E+01 0.471975708E+02
 1G 6 0 103 000000
 1 15 0 2 0 0 0 0 0
 0.759924889E+01 0.221905441E+02-0.280243444E+01
 1G 6 0 0 000000

1	16	0	2	0	0	0	0	0
0.759924889E+01 0.471905288E+02-0.280244398E+01								
1G	6	0	0	000000				
1	17	0	2	0	0	0	0	0
0.759924889E+01 0.221905517E+02 0.221975555E+02								
1G	6	0	0	000000				
1	18	0	2	0	0	0	0	0
0.759924889E+01 0.221905632E+02 0.471975402E+02								
1G	6	0	0	000000				
1	19	0	2	0	0	0	0	0
0.759924889E+01 0.471905441E+02 0.221975441E+02								
1G	6	0	0	000000				
1	20	0	2	0	0	0	0	0
0.759924889E+01 0.471905441E+02 0.471975402E+02								
1G	6	0	0	000000				
2	1	2	2	0	0	0	0	0
0.759924889E+01 0.471905365E+02-0.280244398E+01								
2	2	2	1	0	0	0	0	0
0.759924889E+01 0.471905365E+02-0.280244398E+01								
2	1	3	0	0	0	0	0	0
2	5	2	2	0	0	0	0	0
0.759924889E+01 0.471905365E+02-0.280244398E+01								
2	2	2	1	0	0	0	0	0
0.759924889E+01 0.471905365E+02-0.280244398E+01								
2	2	8	0	0	0	0	0	0
2	6	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	3	7	9	4	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	7	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	7	8	12	9	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	12	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	12	15	17	13	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	13	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	15	16	19	17	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	14	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	13	17	18	14	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	15	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	17	19	20	18	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	16	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	9	10	5	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	17	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	9	12	13	10	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	18	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	5	10	11	6	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	19	4	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	3	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	10	13	14	11	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
3	1	1	20	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.000000000E+00 0.100000000E+01 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00								
0.000000000E+00 0.205000000E+09 0.205000000E+09 0.205000000E+09 0.300000012E+00								
0.300000012E+00 0.300000012E+00 0.788461437E+08 0.788461437E+08 0.788461437E+08								
0.000000000E+00 0.275961535E+09 0.118269232E+09 0.118269232E+09 0.275961535E+09								

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และเมื่อ RUN ด้วย "CPL PSP TEST4 0 1" แล้ว จะได้

7.2.3 เพิ่มประเภท COMO ที่ได้

INPUT (NEUTRAL) FILE : TEST4.DEF
 OUTPUT FILE (__.DAT) : TEST4.DAT
 STATIC (0) OR DYNAMIC (1) ANALYSIS
 0

@@ PROCESSING NODE @@
 @@ PROCESSING ELEMENT @@
 ELEMENT NO. SHAPE CODE VAR. CODE
 1 2 0
 5 2 0
 6 4 0
 7 4 0
 12 4 0
 13 4 0
 14 4 0
 15 4 0
 16 4 0
 17 4 0
 18 4 0
 19 4 0

@@ PROCESSING MATERIAL PROPERTY @@
 @@ PROCESSING ELEMENT PROPERTY @@
 @@ PROCESSING NODE FORCE @@
 @@ PROCESSING NODE DISPLACEMENT @@
 READING IS COMPLETE, NOW IN WRITING PROCESS

/ B E A M /
 **ELEMENT NO. 5 IS CHANGED TO BE NO. 2 **

/ 2-D Q U A D. /
 ** MATERIAL ID. NO. 2 IS CHANGED TO BE NO. 1 **
 **ELEMENT NO. 6 IS CHANGED TO BE NO. 1 **
 **ELEMENT NO. 7 IS CHANGED TO BE NO. 2 **
 **ELEMENT NO. 12 IS CHANGED TO BE NO. 3 **
 **ELEMENT NO. 13 IS CHANGED TO BE NO. 4 **
 **ELEMENT NO. 14 IS CHANGED TO BE NO. 5 **
 **ELEMENT NO. 15 IS CHANGED TO BE NO. 6 **
 **ELEMENT NO. 16 IS CHANGED TO BE NO. 7 **
 **ELEMENT NO. 17 IS CHANGED TO BE NO. 8 **
 **ELEMENT NO. 18 IS CHANGED TO BE NO. 9 **
 **ELEMENT NO. 19 IS CHANGED TO BE NO. 10 **

/ C O N C E N T R A T E D L O A D / *
 **** STOP

7.2.4 แฟ้มข้อมูลเข้าสำหรับ"แซฟ 4"ที่ได้

THIS IS THE BEAMS AND PLANE STRESSES FOR SAP IV.

20	2	1	0	0	0					
1	1	1	1	1	1	1	7.599	-52.809	-60.000	0.000
2	1	1	1	1	1	1	7.599	-2.809	-60.000	0.000
3	1	0	0	1	1	1	7.599	-52.809	-32.802	0.000
4	0	0	0	0	0	0	7.599	-52.809	-2.802	0.000
5	0	0	0	0	0	0	7.599	-52.809	22.198	0.000
6	0	0	0	0	0	0	7.599	-52.809	47.198	0.000
7	0	0	0	0	0	0	7.599	-27.809	-32.802	0.000
8	1	0	0	1	1	1	7.599	-2.809	-32.802	0.000
9	0	0	0	0	0	0	7.599	-27.809	-2.802	0.000
10	0	0	0	0	0	0	7.599	-27.809	22.198	0.000
11	0	0	0	0	0	0	7.599	-27.809	47.198	0.000
12	0	0	0	0	0	0	7.599	-2.809	-2.802	0.000
13	0	0	0	0	0	0	7.599	-2.809	22.198	0.000
14	0	0	0	0	0	0	7.599	-2.809	47.198	0.000
15	0	0	0	0	0	0	7.599	22.191	-2.802	0.000
16	0	0	0	0	0	0	7.599	47.191	-2.802	0.000
17	0	0	0	0	0	0	7.599	22.191	22.198	0.000
18	0	0	0	0	0	0	7.599	22.191	47.198	0.000
19	0	0	0	0	0	0	7.599	47.191	22.198	0.000
20	0	0	0	0	0	0	7.599	47.191	47.198	0.000

2 2 1 1

1 0.205E+09 0.300E+00 0.700E-02 0.000E+00

1 0.340E+02 0.230E+02 0.230E+02 0.400E+02 0.350E+02 0.350E+02

1.000 1.000 1.000 1.000

1.000 1.000 1.000 1.000

1.000 1.000 1.000 1.000

1 1 3 16 1 1

2 2 8 16 1 1

4 10 1 1 2

1 0.100E-04 0.200E+01 0.300E+02

68.500 0.100E+08 0.110E+08 0.120E+08 0.300E+00 0.270E+00 0.250E+00 0.250E+07

0.100E-03 0.100E-03 0.110E-03

1.000 1.000 1.000 1.000 1.000

1.000 1.000 1.000 1.000 1.000

1.000 1.000 1.000 1.000 1.000

1.000 1.000 1.000 1.000 1.000

1 3 7 9 4 1 0.000E+00 0.000E+00 0 0.200E+00

2 7 8 12 9 1 0.000E+00 0.000E+00 0 0.200E+00

3 12 15 17 13 1 0.000E+00 0.000E+00 0 0.200E+00

4 15 16 19 17 1 0.000E+00 0.000E+00 0 0.200E+00

5 13 17 18 14 1 0.000E+00 0.000E+00 0 0.200E+00

6 17 19 20 18 1 0.000E+00 0.000E+00 0 0.200E+00

7 4 9 10 5 1 0.000E+00 0.000E+00 0 0.200E+00

8 9 12 13 10 1 0.000E+00 0.000E+00 0 0.200E+00

9 5 10 11 6 1 0.000E+00 0.000E+00 0 0.200E+00

10 10 13 14 11 1 0.000E+00 0.000E+00 0 0.200E+00

16 1 0.000E+00 0.000E+00 0.200E+02 0.000E+00 0.000E+00 0.000E+00

1.000 0.000 0.000 0.000

7.2.5 แน้มผลลัพธ์จาก"แฟ้ม 4"ที่ได้

If the ERROR occurred during an execution program SAP4.
Please attach to SAP4TEMP directory and delete the temporary files.

INPUT DATA FILE NAME TEST4.DAT
THIS IS THE BEAMS AND PLANE STRESSSES FOR SAP IV.

CONTROL INFORMATION

NUMBER OF NODAL POINTS = 20
NUMBER OF ELEMENT TYPES = 2
NUMBER OF LOAD CASES = 1
NUMBER OF FREQUENCIES = 0
ANALYSIS CODE (NDYN) = 0
EQ.0, STATIC
EQ.1, MODAL EXTRACTION
EQ.2, FORCED RESPONSE
EQ.3, RESPONSE SPECTRUM
EQ.4, DIRECT INTEGRATION
SOLUTION MODE (MODRY) = 0
EQ.0, EXECUTION
EQ.1, DATA CHECK
NUMBER OF SUBSPACE
ITERATION VECTORS (NAD) = 0
EQUATIONS PER BLOCK = 0
TAPR10 SAVE FLAG (N10SV) = 0

NODAL POINT INPUT DATA							NODAL POINT COORDINATES				
ONODE	BOUNDARY CONDITION CODES										
NUMBER	X	Y	Z	XX	YY	ZZ	X	Y	Z	T	
1	1	1	1	1	1	1	7.599	-52.809	-60.000	0	0.000
2	1	1	1	1	1	1	7.599	-2.809	-60.000	0	0.000
3	1	0	0	1	1	1	7.599	-52.809	-32.802	0	0.000
4	0	0	0	0	0	0	7.599	-52.809	-2.802	0	0.000
5	0	0	0	0	0	0	7.599	-52.809	22.198	0	0.000
6	0	0	0	0	0	0	7.599	-52.809	47.198	0	0.000
7	0	0	0	0	0	0	7.599	-27.809	-32.802	0	0.000
8	1	0	0	1	1	1	7.599	-2.809	-32.802	0	0.000
9	0	0	0	0	0	0	7.599	-27.809	-2.802	0	0.000
10	0	0	0	0	0	0	7.599	-27.809	22.198	0	0.000
11	0	0	0	0	0	0	7.599	-27.809	47.198	0	0.000
12	0	0	0	0	0	0	7.599	-2.809	-2.802	0	0.000
13	0	0	0	0	0	0	7.599	-2.809	22.198	0	0.000
14	0	0	0	0	0	0	7.599	-2.809	47.198	0	0.000
15	0	0	0	0	0	0	7.599	22.191	-2.802	0	0.000
16	0	0	0	0	0	0	7.599	47.191	-2.802	0	0.000
17	0	0	0	0	0	0	7.599	22.191	22.198	0	0.000
18	0	0	0	0	0	0	7.599	22.191	47.198	0	0.000
19	0	0	0	0	0	0	7.599	47.191	22.198	0	0.000
20	0	0	0	0	0	0	7.599	47.191	47.198	0	0.000

1GENERATED NODAL DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	T
1	1	1	1	1	1	1	7.599	-52.809	-60.000	0.000
2	1	1	1	1	1	1	7.599	-2.809	-60.000	0.000
3	1	0	0	1	1	1	7.599	-52.809	-32.802	0.000
4	0	0	0	0	0	0	7.599	-52.809	-2.802	0.000
5	0	0	0	0	0	0	7.599	-52.809	22.198	0.000
6	0	0	0	0	0	0	7.599	-52.809	47.198	0.000
7	0	0	0	0	0	0	7.599	-27.809	-32.802	0.000
8	1	0	0	1	1	1	7.599	-2.809	-32.802	0.000
9	0	0	0	0	0	0	7.599	-27.809	-2.802	0.000
10	0	0	0	0	0	0	7.599	-27.809	22.198	0.000
11	0	0	0	0	0	0	7.599	-27.809	47.198	0.000
12	0	0	0	0	0	0	7.599	-2.809	-2.802	0.000
13	0	0	0	0	0	0	7.599	-2.809	22.198	0.000
14	0	0	0	0	0	0	7.599	-2.809	47.198	0.000
15	0	0	0	0	0	0	7.599	22.191	-2.802	0.000
16	0	0	0	0	0	0	7.599	47.191	-2.802	0.000
17	0	0	0	0	0	0	7.599	22.191	22.198	0.000
18	0	0	0	0	0	0	7.599	22.191	47.198	0.000
19	0	0	0	0	0	0	7.599	47.191	22.198	0.000
20	0	0	0	0	0	0	7.599	47.191	47.198	0.000

1EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	1	2	0	0	0
4	3	4	5	6	7	8
5	9	10	11	12	13	14
6	15	16	17	18	19	20
7	21	22	23	24	25	26
8	0	27	28	0	0	0
9	29	30	31	32	33	34
10	35	36	37	38	39	40
11	41	42	43	44	45	46
12	47	48	49	50	51	52
13	53	54	55	56	57	58
14	59	60	61	62	63	64
15	65	66	67	68	69	70
16	71	72	73	74	75	76
17	77	78	79	80	81	82
18	83	84	85	86	87	88
19	89	90	91	92	93	94
20	95	96	97	98	99	100

13 / D B E A M E L E M E N T S

NUMBER OF BEAMS = 2
 NUMBER OF GEOMETRIC PROPERTY SETS = 1
 NUMBER OF FIXED END FORCK SETS = 0
 NUMBER OF MATERIALS = 1



MATERIAL PROPERTIES

MATERIAL NUMBER	YOUNG'S MODULUS	POISSON'S RATIO	MASS DENSITY	WEIGHT DENSITY
1	0.2050E+09	0.3000	0.7000E-02	0.0000E+00

BEAM GEOMETRIC PROPERTIES

SECTION NUMBER	AXIAL AREA A(1)	SHEAR AREA A(2)	SHEAR AREA A(3)	TORSION J(1)	INERTIA I(2)	INERTIA I(3)
1	0.3400E+02	0.2300E+02	0.2300E+02	0.4000E+02	0.3500E+02	0.3500E+02

ELEMENT LOAD MULTIPLIERS

	A	B	C	D
X-DIR	0.100000E+01	0.100000E+01	0.100000E+01	0.100000E+01
Y-DIR	0.100000E+01	0.100000E+01	0.100000E+01	0.100000E+01
Z-DIR	0.100000E+01	0.100000E+01	0.100000E+01	0.100000E+01

13/D BEAM ELEMENT DATA

BEAM NUMBER	NODE -I	NODE -J	NODE -K	MATERIAL NUMBER	SECTION NUMBER	ELEMENT END LOADS				END CODES	
						A	B	C	D	-I	-J
1	1	3	16	1	1	0	0	0	0	0	0
2	2	8	16	1	1	0	0	0	0	0	0

1PLANE STRESS ANALYSIS

NUMBER OF ELEMENTS = 10
 NUMBER OF MATERIALS = 1
 MAXIMUM TEMPERATURES PER MATERIAL = 1
 ANALYSIS CODE = 2
 CODE FOR INCLUSION OF BENDING MODES = 0
 EQ. 0, INCLUDE
 GT. 0, SUPPRESS

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MATERIAL I.D. NUMBER = 1
 NUMBER OF TEMPERATURES = 1
 WEIGHT DENSITY = 0.1000E-04
 MASS DENSITY = 0.2000E+01
 BETA ANGLE = 30.000

TEMPERATURE	E(N)	E(S)	E(T)	NU(NS)	NU(NT)	NU(ST)	G(NS)	ALPHA(N)	ALPHA(S)	ALPHA
68.50	0.1000E+08	0.1100E+08	0.1200E+08	0.3000	0.2700	0.2500	0.2500E+07	0.1000E-03	0.1000E-03	0.1100E-

ELEMENT LOAD MULTIPLIERS

LOAD CASE	TEMPERATURE			PRESSURE		X-GRAVITY	Y-GRAVITY	Z-GRAVITY		
A	1.000			1.000		1.000	1.000	1.000		
B	1.000			1.000		1.000	1.000	1.000		
C	1.000			1.000		1.000	1.000	1.000		
D	1.000			1.000		1.000	1.000	1.000		

ELEMENT NUMBER	I	J	K	L	MATL TYPE	REFERENCE TEMPERATURE	I-J FACE PRESSURE	STRESS OPTION	KG	THICKNESS
1	3	7	9	4	1	0.000	0.000E+00	4	1	0.2000
2	7	8	12	9	1	0.000	0.000E+00	4	1	0.2000
3	12	15	17	13	1	0.000	0.000E+00	4	1	0.2000
4	15	16	19	17	1	0.000	0.000E+00	4	1	0.2000
5	13	17	18	14	1	0.000	0.000E+00	4	1	0.2000
6	17	19	20	18	1	0.000	0.000E+00	4	1	0.2000
7	4	9	10	5	1	0.000	0.000E+00	4	1	0.2000
8	9	12	13	10	1	0.000	0.000E+00	4	1	0.2000
9	5	10	11	6	1	0.000	0.000E+00	4	1	0.2000
10	10	13	14	11	1	0.000	0.000E+00	4	1	0.2000

EQUATION PARAMETERS

TOTAL NUMBER OF EQUATIONS = 100
 BANDWIDTH = 34
 NUMBER OF EQUATIONS IN A BLOCK = 97
 NUMBER OF BLOCKS = 2

NODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
16	1	0.00000E+00	0.00000E+00	0.20000E+02	0.00000E+00	0.00000E+00	0.00000E+00

STRUCTURE LOAD CASE ELEMENT LOAD MULTIPLIERS

LOAD CASE	A	B	C	D
1	1.000	0.000	0.000	0.000

INDEX DISPLACEMENTS / ROTATIONS

NODE NUMBER	LOAD CASE	X-TRANSLATION	Y-TRANSLATION	Z-TRANSLATION	X-ROTATION	Y-ROTATION	Z-ROTATION	
0	20	1	0.00000E+00	-0.27568E-03	0.38437E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	19	1	0.00000E+00	-0.13966E-03	0.39168E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	18	1	0.00000E+00	-0.26626E-03	0.24807E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	17	1	0.00000E+00	-0.14083E-03	0.23981E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	16	1	0.00000E+00	0.23497E-04	0.41862E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	15	1	0.00000E+00	0.70935E-05	0.23941E-03	0.00000E+00	0.00000E+00	0.00000E+00

0	14	1	0.00000E+00	-0.24487E-03	0.11500E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	13	1	0.00000E+00	-0.12759E-03	0.10162E-03	0.00000E+00	0.00000E+00	0.00000E+00
0	12	1	0.00000E+00	-0.20109E-04	0.84089E-04	0.00000E+00	0.00000E+00	0.00000E+00
0	11	1	0.00000E+00	-0.22377E-03	0.66330E-05	0.00000E+00	0.00000E+00	0.00000E+00
0	10	1	0.00000E+00	-0.12113E-03	0.40451E-05	0.00000E+00	0.00000E+00	0.00000E+00
0	9	1	0.00000E+00	-0.27816E-04	0.33007E-05	0.00000E+00	0.00000E+00	0.00000E+00
0	8	1	0.00000E+00	-0.15459E-05	0.15608E-06	0.00000E+00	0.00000E+00	0.00000E+00
0	7	1	0.00000E+00	0.16934E-04	0.17255E-04	0.00000E+00	0.00000E+00	0.00000E+00
0	6	1	0.00000E+00	-0.21825E-03	-0.85226E-04	0.00000E+00	0.00000E+00	0.00000E+00
0	5	1	0.00000E+00	-0.12432E-03	-0.76394E-04	0.00000E+00	0.00000E+00	0.00000E+00
0	4	1	0.00000E+00	-0.43065E-04	-0.43287E-04	0.00000E+00	0.00000E+00	0.00000E+00
0	3	1	0.00000E+00	0.15588E-05	-0.77834E-07	0.00000E+00	0.00000E+00	0.00000E+00
0	2	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	1	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

1..... BEAM FORCES AND MOMENTS

OB	BEAM	LOAD	AXIAL	SHEAR	SHEAR	TORSION	BENDING	BENDING
NO.	NO.		R1	R2	R3	M1	M2	M3
1	1	1.995E+01	-6.269E+00	0.000E-01	0.000E-01	0.000E-01	-8.525E+01	
		-1.995E+01	6.269E+00	0.000E-01	0.000E-01	0.000E-01	-8.525E+01	
2	1	-4.000E+01	6.217E+00	0.000E-01	0.000E-01	0.000E-01	8.454E+01	
		4.000E+01	-6.217E+00	0.000E-01	0.000E-01	0.000E-01	8.454E+01	

1TWO - DIMENSIONAL FINITE ELEMENTS

1. CENTROID STRESSES REFERENCED TO LOCAL Y-Z COORDINATES.
2. MID-SIDE STRESSES ARE NORMAL AND PARALLEL TO ELEMENT EDGES.

ELEMENT (1)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.17699E+01	-0.70988E+01	0.00000E+00	0.37508E+00	0.17857E+01	-0.71146E+01	2.42	
ELEMENT (2)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.31456E+01	0.11108E+02	0.00000E+00	-0.36588E+00	0.11125E+02	0.31289E+01	-87.37	
ELEMENT (3)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.47258E+01	0.43127E+01	0.00000E+00	0.26072E+01	0.71346E+01	0.19038E+01	42.74	
ELEMENT (4)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.13216E+01	-0.43861E+01	0.00000E+00	0.21225E+01	0.20244E+01	-0.50889E+01	18.32	
ELEMENT (5)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	-0.47228E+01	0.94121E+00	0.00000E+00	0.13958E+01	0.12665E+01	-0.50480E+01	76.88	
ELEMENT (6)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	-0.13206E+01	-0.10280E+01	0.00000E+00	0.18785E+01	0.70982E+00	-0.30585E+01	47.23	
ELEMENT (7)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.36754E+00	-0.42892E+01	0.00000E+00	-0.27438E+01	0.16377E+01	-0.55594E+01	-24.84	
ELEMENT (8)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	0.16750E+01	0.43687E+01	0.00000E+00	-0.19799E+01	0.54164E+01	0.62722E+00	-62.11	
ELEMENT (9)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	-0.12392E+01	-0.10734E+01	0.00000E+00	-0.16972E+01	0.54285E+00	-0.28555E+01	-46.40	
ELEMENT (10)								
LOAD LOC	S11	S22	S33	S12	S-MAX	S-MIN	ANGLE	
1 CEN	-0.42008E+01	0.11623E+01	0.00000E+00	-0.15751E+01	0.15906E+01	-0.46292E+01	-74.79	

STATIC SOLUTION TIME LOG

EQUATION SOLUTION = 0.82
DISPLACEMENT OUTPUT = 0.29
STRESS RECOVERY = 0.45

OVERALL TIME LOG

NODAL POINT INPUT = 0.80
ELEMENT STIFFNESS FORMATION = 1.25
NODAL LOAD INPUT = 0.08
TOTAL STIFFNESS FORMATION = 0.47
STATIC ANALYSIS = 1.58
EIGENVALUE EXTRACTION = 0.00
FORCED RESPONSE ANALYSIS = 0.00
RESPONSE SPECTRUM ANALYSIS = 0.00
STEP-BY-STEP INTEGRATION = 0.00

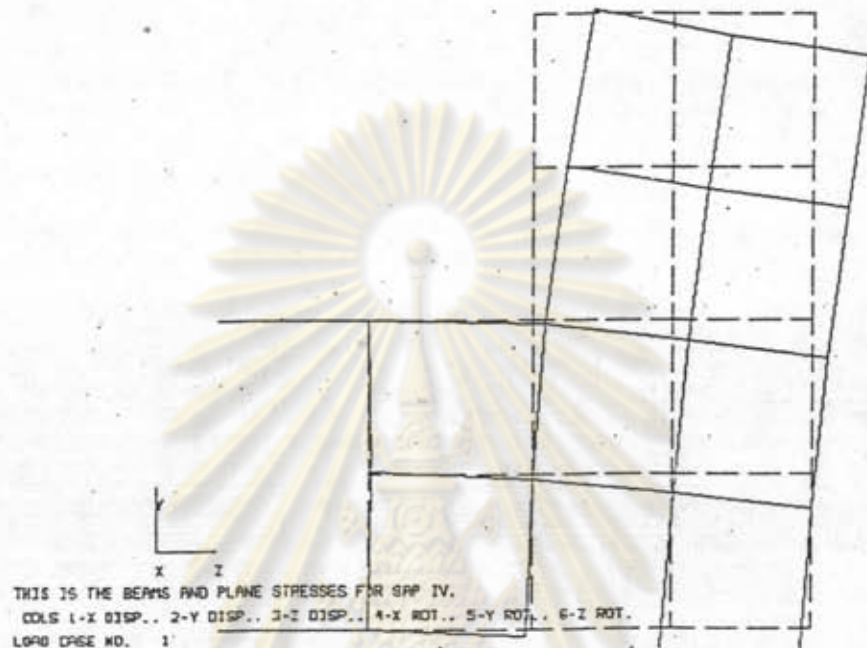
TOTAL SOLUTION TIME = 4.18

**** STOP



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7.2.6 รูปและแผนผังการจัดที่ได้



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 จุฬาลงกรณ์มหาวิทยาลัย

THIS IS THE BEAMS AND PLANK STRESSES FOR SAP IV.

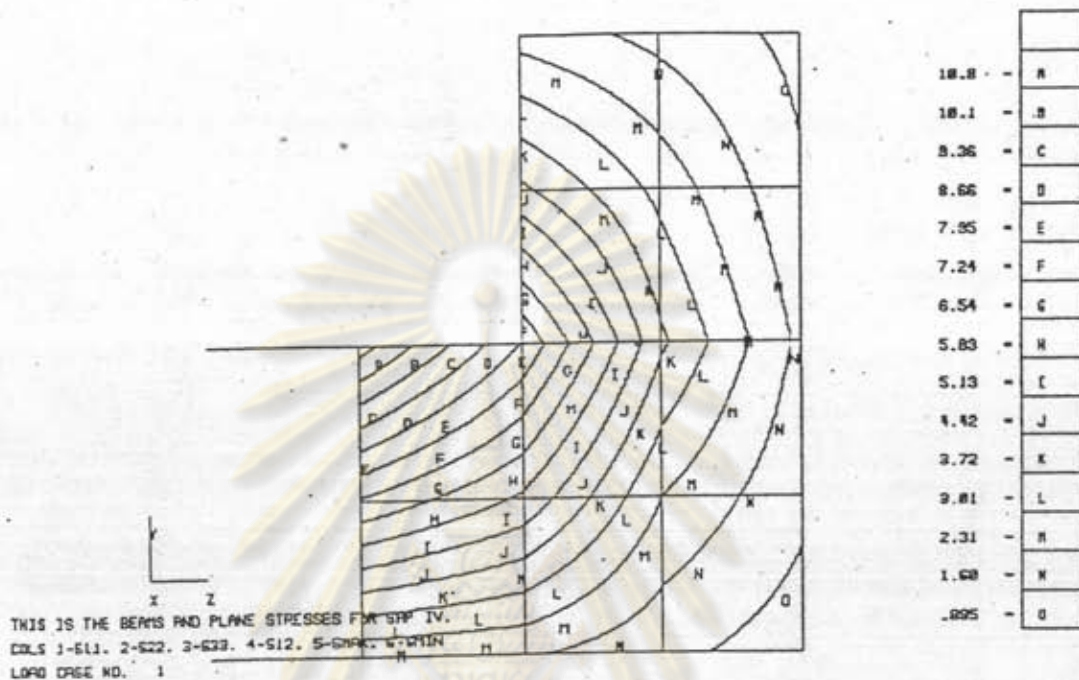
20 20 0.418620E-03 16 6

COLS 1-Y DISP., 2-Y DISP., 3-Z DISP., 4-Y ROT., 5-Y ROT., 6-Z ROT.

LOAD CASE NO. 1

10.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
20.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
30.0000000E+00.1558800E-05-.7783400E-070.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
40.0000000E+00-.4306500E-04-.4328700E-040.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
50.0000000E+00-.1243200E-03-.7639400E-040.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
60.0000000E+00-.2182500E-03-.8522600E-040.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
70.0000000E+00.1693400E-040.1725500E-040.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
80.0000000E+00-.1545900E-050.1560800E-060.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
90.0000000E+00-.2781600E-040.3300700E-050.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
100.0000000E+00-.1211300E-030.4045100E-050.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
110.0000000E+00-.2237700E-030.6633000E-050.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
120.0000000E+00-.2010900E-040.8408900E-040.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
130.0000000E+00-.1275900E-030.1016200E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
140.0000000E+00-.2448700E-030.1150000E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
150.0000000E+000.7093500E-050.2394100E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
160.0000000E+000.2349700E-040.4186200E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
170.0000000E+00-.1408300E-030.2398100E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
180.0000000E+00-.2662600E-030.2480700E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
190.0000000E+00-.1396600E-030.3916800E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00
200.0000000E+00-.2756800E-030.3843700E-030.0000000E+00.0000000E+00.0000000E+00
0.0000000E+00

7.2.7 รูปและแผนผังผลลัพธ์ที่เอเลเมนต์ที่ได้



เมื่อพิจารณาค่าในคอลัมน์ความเค้นสูงสุด

THIS IS THE BEAMS AND PLANE STRESSES FOR SAP IV.

6
 COLS 1-S11, 2-S22, 3-S33, 4-S12, 5-Smax, 6-Smin
 LOAD CASE NO. 1

6
 4
 0.1769900E+01-.7098800E+010.0000000E+000.3750800E+000.1785700E+01-.7114600E+01
 7
 4
 0.3145600E+010.1110800E+020.0000000E+00-.3658800E+000.1112500E+020.3128900E+01
 12
 4
 0.4725800E+010.4312700E+010.0000000E+000.2607200E+010.7134600E+010.1903800E+01
 13
 4
 0.1321600E+01-.4386100E+010.0000000E+000.2122500E+010.2024400E+01-.5088900E+01
 14
 4
 -.4722800E+010.9412100E+000.0000000E+000.1395800E+010.1266500E+01-.5048000E+01
 15
 4
 -.1320600E+01-.1028000E+010.0000000E+000.1878500E+010.7098200E+00-.3058500E+01
 16
 4
 0.3675400E+00-.4289200E+010.0000000E+00-.2743800E+010.1637700E+01-.5559400E+01
 17
 4
 0.1675000E+010.4368700E+010.0000000E+00-.1979900E+010.5416400E+010.6272200E+00
 18
 4
 -.1239200E+01-.1073400E+010.0000000E+00-.1697200E+010.5428500E+00-.2855500E+01
 19
 4
 -.4200800E+010.1162300E+010.0000000E+00-.1575100E+010.1590600E+01-.4629200E+01

7.2.8 แผนผังผลลัพธ์

THIS IS THE BEAMS AND PLANE STRESSES FOR SAP IV.
 COLS 1-R1, 2-R2, 3-R3, 4-M1, 5-M2, 6-M3
 LOAD CASE NO. 1

1,0, 0.200E+02, -0.627E+01, 0.000E+00, 0.000E+00, 0.000E+00, -0.852E+02
 1,1, -0.200E+02, 0.627E+01, 0.000E+00, 0.000E+00, 0.000E+00, -0.852E+02
 5,0, -0.400E+02, 0.622E+01, 0.000E+00, 0.000E+00, 0.000E+00, 0.845E+02
 5,1, 0.400E+02, -0.622E+01, 0.000E+00, 0.000E+00, 0.000E+00, 0.845E+02



ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย

ตัวอย่างที่ 7.3 เป็นตัวอย่างที่แสดงการใช้ 2 ภาวะเข้มข้นที่แตกต่างกัน กระทำกับ โครงสร้างที่ใช้เอเลเมนต์แบบทริคเซลล์ที่มีคุณสมบัติ ดังนี้

$$E_{11} = E_{22} = E_{33} = 3E4 \text{ N/m}^2$$

$$\nu_{12} = \nu_{13} = \nu_{23} = 0.3$$

$$G_{12} = G_{13} = G_{23} = 1.5E4 \text{ N/m}^2$$

$$\alpha_1 = \alpha_2 = \alpha_3 = 0 / ^\circ\text{C}$$

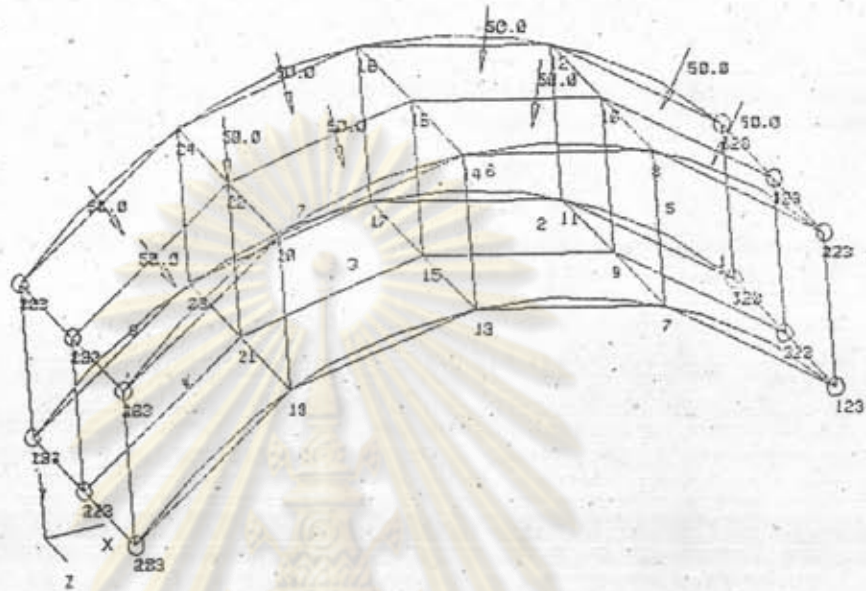
และมีความหนาแน่นเชิงมวล 1 Kg/m^3

และรับภาระกระจายทางด้านบน 50 N/m^2 และภาวะเข้มข้น 2 กรณี ดังนี้



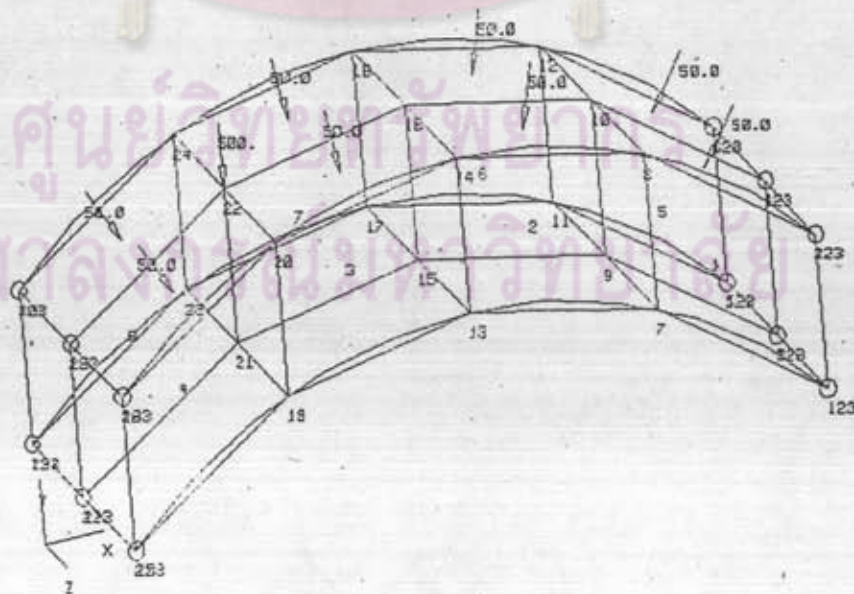
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

1. ภาระเข้มข้นกระทำที่ตำแหน่งโคออร์ดิเนต $X = -2.576, Y = 8.587, Z = -2$ เท่ากับ 50 N ดังรูป



รูปทางไฟไนต์เอเลเมนต์ สำหรับภาระที่ 1

2. ภาระเข้มข้นกระทำที่ตำแหน่งโคออร์ดิเนต $X = -2.576, Y = 8.587, Z = -2$ เท่ากับ 500 N ดังรูป



รูปทางไฟไนต์เอเลเมนต์ สำหรับภาระที่ 2

7.3.1 สร้างข้อมูลใน"พาแนทรน"

```

GO
1
GR,1,,5/5
LI,1,ARC,5(0)/1/89,1
LI,2,TR,/2,1
PA,1,2L,,1,2
SET,LINE,0
SET,CPLOT,ON
VIEW
1
20,20,5
PL
PA,2,TR,/-4,1
HP,1,2P,,1,2
SET,LAB1,OFF
GE,H1,,5/2/3
CF,H1,HEX/8/2
EQIV
N
1
DE,H1,DISP,3(0),1,F1/F2
PL
DE,H1,PRESS,/-50,1,F4
DE,H1,FOR,/-50,1,N22
PL
DE,H1,FOR,/-500,2,N22
PMAT,1,A3F,3.33E-5,-1E-5,-1E-5,3.33E-5,-1E-5,
3.33E-5,6.66E-5,0,0,6.66E-5,0,6.66E-5,9(0),6(0)
PF,H1,HEX/8/2,1/4(0)/1
OPT
3
3
2
NEU
1
1
THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.
Y
Y

```

ศูนย์วิทยทรัพยากร

จุฬาลงกรณ์มหาวิทยาลัย

7.3.2 แฟ้มกลางที่ได้

```

25      0      0      1      0      0      0      0      0
THIS IS THE THICK SKELL (HEX/8/2) FOR SAP IV.
26      0      0      1      30     8      1      1      0
30-JUN-89  15:42:29  2.1
1        1        0        2        0        0        0        0
0.500000190E+01 0.499999809E+01 0.000000000E+00
1G      6        0        0 000000
1        2        0        2        0        0        0        0
0.500000190E+01 0.699999809E+01 0.000000000E+00
1G      6        0        0 000000
1        3        0        2        0        0        0        0
0.500000190E+01 0.499999809E+01-0.200000095E+01
1G      6        0        0 000000
1        4        0        2        0        0        0        0
0.500000190E+01 0.699999809E+01-0.200000095E+01
1G      6        0        0 000000
1        5        0        2        0        0        0        0
0.500000190E+01 0.499999809E+01-0.400000190E+01
1G      6        0        0 000000
1        6        0        2        0        0        0        0
0.500000190E+01 0.699999809E+01-0.400000190E+01
1G      6        0        0 000000
1        7        0        2        0        0        0        0
0.269080877E+01 0.654092407E+01 0.000000000E+00
1G      6        0        0 000000
1        8        0        2        0        0        0        0
0.269080877E+01 0.854092407E+01 0.000000000E+00
1G      6        0        0 000000
1        9        0        2        0        0        0        0
0.269080829E+01 0.654092407E+01-0.200000095E+01
1G      6        0        0 000000
1       10        0        2        0        0        0        0
0.269080829E+01 0.854092407E+01-0.200000095E+01
1G      6        0        0 000000
1       11        0        2        0        0        0        0
0.269080782E+01 0.654092407E+01-0.400000190E+01
1G      6        0        0 000000
1       12        0        2        0        0        0        0
0.269080782E+01 0.854092407E+01-0.400000190E+01
1G      6        0        0 000000
1       13        0        2        0        0        0        0
0.617088079E-01 0.707079411E+01 0.000000000E+00
1G      6        0        0 000000
1       14        0        2        0        0        0        0
0.617095232E-01 0.907079315E+01 0.000000000E+00
1G      6        0        0 000000
1       15        0        2        0        0        0        0
0.617084801E-01 0.707079411E+01-0.200000048E+01
1G      6        0        0 000000

```


1	16	0	2	0	0	0	0	0
0.617091954E-01 0.907079315E+01-0.200000048E+01								
1G	6	0	0	000000				
1	17	0	2	0	0	0	0	0
0.617074966E-01 0.707079411E+01-0.400000190E+01								
1G	6	0	0	000000				
1	18	0	2	0	0	0	0	0
0.617082119E-01 0.907079315E+01-9.400000190E+01								
1G	6	0	0	000000				
1	19	0	2	0	0	0	0	0
-0.257623958E+01 0.658689117E+01 0.000000000E+00								
1G	6	0	0	000000				
1	20	0	2	0	0	0	0	0
-0.257623815E+01 0.858689117E+01 0.000000000E+00								
1G	6	0	0	000000				
1	21	0	2	0	0	0	0	0
-0.257624054E+01 0.658689117E+01-0.200000048E+01								
1G	6	0	0	000000				
1	22	0	2	0	0	0	0	0
-0.257623911E+01 0.858689117E+01-0.200000048E+01								
1G	6	0	0	000000				
1	23	0	2	0	0	0	0	0
-0.257624197E+01 0.658689117E+01-0.400000095E+01								
1G	6	0	0	000000				
1	24	0	2	0	0	0	0	0
-0.257624054E+01 0.858689117E+01-0.400000095E+01								
1G	6	0	0	000000				
1	25	0	2	0	0	0	0	0
-0.491197586E+01 0.508650016E+01 0.000000000E+00								
1G	6	0	0	000000				
1	26	0	2	0	0	0	0	0
-0.491197300E+01 0.708650017E+01 0.000000000E+00								
1G	6	0	0	000000				
1	27	0	2	0	0	0	0	0
-0.491197681E+01 0.508650016E+01-0.200000000E+01								
1G	6	0	0	000000				
1	28	0	2	0	0	0	0	0
-0.491197395E+01 0.708650017E+01-0.200000000E+01								
1G	6	0	0	000000				
1	29	0	2	0	0	0	0	0
-0.491197967E+01 0.508650016E+01-0.400000095E+01								
1G	6	0	0	000000				
1	30	0	2	0	0	0	0	0
-0.491197681E+01 0.708650017E+01-0.400000095E+01								
1G	6	0	0	000000				
2	1	8	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	1	7	8	2	3	9	10	4
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	2	8	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	8	2	1	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	7	13	14	8	9	15	16	10
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	3	8	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	8	2	1	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	13	19	20	14	15	21	22	16
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	4	8	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	8	2	1	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	19	25	26	20	21	27	28	22
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	5	8	2	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	8	2	1	0	0	0	0	0
0.000000000E+00 0.000000000E+00 0.000000000E+00								
2	3	9	10	4	5	11	12	6
0.000000000E+00 0.000000000E+00 0.000000000E+00								

2 6 8 2 0 0 0 0 0
 8 2 1 0 0.000000000E+00 0.000000000E+00 0.000000000E+00
 9 15 16 10 11 17 18 12
 2 7 8 2 0 0 0 0 0
 8 2 1 0 0.000000000E+00 0.000000000E+00 0.000000000E+00
 15 21 22 16 17 23 24 18
 2 8 8 2 0 0 0 0 0
 8 2 1 0 0.000000000E+00 0.000000000E+00 0.000000000E+00
 21 27 28 22 23 29 30 24
 3 1 7 20 0 0 0 0 0
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.700000000E+01 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.300300156E+05 0.300300233E+05 0.300300351E+05 0.300300300E+00
 0.300300419E+00 0.300300300E+00 0.150150136E+05 0.150150136E+05 0.150150136E+05
 0.000000000E+00 0.404591015E+05 0.173644257E+05 0.173644335E+05 0.404591093E+05
 0.173644335E+05 0.404591249E+05 0.150150136E+05 0.000000000E+00 0.000000000E+00
 0.150150136E+05 0.000000000E+00 0.150150136E+05 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00
 4 1 1 2 8 8 2 6 0
 0.100000000E+01 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.100000000E+01
 6 1 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 2 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 3 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 4 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 5 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 6 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 7 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 6 8 1 2 0 0 0 0 0
 11001000000110011 4
 -0.500000000E+02
 7 22 1 2 0 0 0 0 0
 0010000
 -0.500000000E+02

มหาวิทยาลัยราชภัฏวชิรวิทยาดอนเมือง
 วิทยาลัยราชภัฏวชิรวิทยาดอนเมือง



7	22	2	2	0	0	0	0	0
	0010000							
-0.5000000000E+03								
8	1	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	2	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	3	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	4	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	5	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	6	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	25	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	26	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	27	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	28	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	29	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
8	30	1	2	0	0	0	0	0
	0111000							
0.0000000000E+00	0.0000000000E+00	0.0000000000E+00	0.0000000000E+00					
31	1	0	1	0	0	0	0	0
	0.5000000000E+01	0.5000000000E+01	0.0000000000E+00					
31	2	0	1	0	0	0	0	0
	-0.491197491E+01	0.508650016E+01	0.748333149E-06					
31	3	0	1	0	0	0	0	0
	0.500000190E+01	0.699999809E+01	-0.144106948E-12					
31	4	0	1	0	0	0	0	0
	-0.491197491E+01	0.708650017E+01	0.748333149E-06					
31	5	0	1	0	0	0	0	0
	0.500000190E+01	0.499999809E+01	-0.400000095E+01					
31	6	0	1	0	0	0	0	0
	0.500000190E+01	0.699999809E+01	-0.400000095E+01					
31	7	0	1	0	0	0	0	0
	-0.491197491E+01	0.708650017E+01	-0.399999952E+01					
31	8	0	1	0	0	0	0	0
	-0.491197491E+01	0.508650016E+01	-0.399999952E+01					
32	1	0	3	0	0	0	0	0
	0.500000190E+01	-0.491197491E+01	-0.818221092E+01	-0.832377434E+01	0.499999809E+01			
	0.508650016E+01	0.818219757E+01	-0.803816604E+01	-0.144106948E-12	0.748333149E-06			
	0.617738690E-06	0.628426731E-06	1	2				

-0.400000095E+01 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00-0.400000095E+01-0.400000095E+01 0.000000000E+00 0.000000000E+00
 -0.400000095E+01-0.400000095E+01 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00 0.000000000E+00
 0.000000000E+00 0.000000000E+00

44 1 3 4 2 5 6 7 8
 1 1 30 35 1 0 0 0 0
 1 5 2 3 0 0 0 0 0
 0 0 6 6 0 0 0 0 31 0

0.100000000E+01 0.100000000E+01 0.100000000E+01
 0.400000000E+01 0.100000000E+01 0.200000000E+01
 0 0 0 0 0 0 0 0 0 30
 0.000000000E+00 0.000000000E+00 0.000000000E+00 0 -1
 0.000000000E+00 0.100000000E+01 0.000000000E+00 0 -2
 0.000000000E+00 0.000000000E+00 0.500000000E+00 0 -3
 0.000000000E+00 0.100000000E+01 0.500000000E+00 0 -4
 0.000000000E+00 0.000000000E+00 0.100000000E+01 0 -5
 0.000000000E+00 0.100000000E+01 0.100000000E+01 0 -6
 0.250000000E+00 0.000000000E+00 0.000000000E+00 0 -7
 0.250000000E+00 0.100000000E+01 0.000000000E+00 0 -8
 0.250000000E+00 0.000000000E+00 0.500000000E+00 0 -9
 0.250000000E+00 0.100000000E+01 0.500000000E+00 0 -10
 0.250000000E+00 0.000000000E+00 0.100000000E+01 0 -11
 0.250000000E+00 0.100000000E+01 0.100000000E+01 0 -12
 0.500000000E+00 0.000000000E+00 0.000000000E+00 0 -13
 0.500000000E+00 0.100000000E+01 0.000000000E+00 0 -14
 0.500000000E+00 0.000000000E+00 0.500000000E+00 0 -15
 0.500000000E+00 0.100000000E+01 0.500000000E+00 0 -16
 0.500000000E+00 0.000000000E+00 0.100000000E+01 0 -17
 0.500000000E+00 0.100000000E+01 0.100000000E+01 0 -18
 0.750000000E+00 0.000000000E+00 0.000000000E+00 0 -19
 0.750000000E+00 0.100000000E+01 0.000000000E+00 0 -20
 0.750000000E+00 0.000000000E+00 0.500000000E+00 0 -21
 0.750000000E+00 0.100000000E+01 0.500000000E+00 0 -22
 0.750000000E+00 0.000000000E+00 0.100000000E+01 0 -23
 0.750000000E+00 0.100000000E+01 0.100000000E+01 0 -24
 0.100000000E+01 0.000000000E+00 0.000000000E+00 0 -25
 0.100000000E+01 0.100000000E+01 0.000000000E+00 0 -26
 0.100000000E+01 0.000000000E+00 0.500000000E+00 0 -27
 0.100000000E+01 0.100000000E+01 0.500000000E+00 0 -28
 0.100000000E+01 0.000000000E+00 0.100000000E+01 0 -29
 0.100000000E+01 0.100000000E+01 0.100000000E+01 0 -30

45 1 8 10 0 0 0 0 0
 4 1 8 0 1 8
 9 8 8 2 4 1
 1 7 8 2 3 9 10 4 -1 7
 13 14 8 9 15 16 10 -2 13 19
 20 14 15 21 22 16 -3 19 25 26
 20 21 27 28 22 -4 3 9 10 4
 5 11 12 6 -5 9 15 16 10 11
 17 18 12 -6 15 21 22 16 17 23
 24 18 -7 21 27 28 22 23 29 30
 24 -8

99 0 0 1 0 0 0 0 0 0

และเมื่อ RUN ด้วย "CPL PSP THETSH8 0 1" แล้ว จะได้

7.3.3 เพิ่มประเภท COMO ที่ได้

INPUT (NEUTRAL) FILE : THETSH8.DEF
 OUTPUT FILE (____.DAT) : THETSH8.DAT
 STATIC (0) OR DYNAMIC (1) ANALYSIS
 0

@@ PROCESSING NODE @@

@@ PROCESSING ELEMENT @@

ELEMENT NO.	SHAPE CODE	VAR. CODE
1	8	1
2	8	1
3	8	1
4	8	1
5	8	1
6	8	1
7	8	1
8	8	1

@@ PROCESSING MATERIAL PROPERTY @@

@@ PROCESSING ELEMENT PROPERTY @@

@@ PROCESSING DISTRIBUTED LOAD @@

@@ PROCESSING NODE FORCE @@

@@ PROCESSING NODE DISPLACEMENT @@

READING IS COMPLETE, NOW IN WRITING PROCESS

/ 8 NODES THICK SHELL /

** PRESSURE NO. 1 IS CHANGED TO BE NO. 2 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 3 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 4 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 5 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 6 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 7 **

** PRESSURE NO. 1 IS CHANGED TO BE NO. 8 **

/ CONCENTRATED LOAD /

**** STOP

7.3.4 แฟ้มข้อมูลเข้าสำหรับ"แชฟ 4"ที่ได้

THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.

30	1	2	0	0	0					
1	1	1	1	0	0	0	5.000	5.000	0.000	0.000
2	1	1	1	0	0	0	5.000	7.000	0.000	0.000
3	1	1	1	0	0	0	5.000	5.000	-2.000	0.000
4	1	1	1	0	0	0	5.000	7.000	-2.000	0.000
5	1	1	1	0	0	0	5.000	5.000	-4.000	0.000
6	1	1	1	0	0	0	5.000	7.000	-4.000	0.000
7	0	0	0	0	0	0	2.691	6.541	0.000	0.000
8	0	0	0	0	0	0	2.691	8.541	0.000	0.000
9	0	0	0	0	0	0	2.691	6.541	-2.000	0.000
10	0	0	0	0	0	0	2.691	8.541	-2.000	0.000
11	0	0	0	0	0	0	2.691	6.541	-4.000	0.000
12	0	0	0	0	0	0	2.691	8.541	-4.000	0.000
13	0	0	0	0	0	0	0.062	7.071	0.000	0.000
14	0	0	0	0	0	0	0.062	9.071	0.000	0.000
15	0	0	0	0	0	0	0.062	7.071	-2.000	0.000
16	0	0	0	0	0	0	0.062	9.071	-2.000	0.000
17	0	0	0	0	0	0	0.062	7.071	-4.000	0.000
18	0	0	0	0	0	0	0.062	9.071	-4.000	0.000
19	0	0	0	0	0	0	-2.576	6.587	0.000	0.000
20	0	0	0	0	0	0	-2.576	8.587	0.000	0.000
21	0	0	0	0	0	0	-2.576	6.587	-2.000	0.000
22	0	0	0	0	0	0	-2.576	8.587	-2.000	0.000
23	0	0	0	0	0	0	-2.576	6.587	-4.000	0.000
24	0	0	0	0	0	0	-2.576	8.587	-4.000	0.000
25	1	1	1	0	0	0	-4.912	5.087	0.000	0.000
26	1	1	1	0	0	0	-4.912	7.087	0.000	0.000
27	1	1	1	0	0	0	-4.912	5.087	-2.000	0.000
28	1	1	1	0	0	0	-4.912	7.087	-2.000	0.000
29	1	1	1	0	0	0	-4.912	5.087	-4.000	0.000
30	1	1	1	0	0	0	-4.912	7.087	-4.000	0.000
8	8	1	1	0	8	8	0			
1	1	0.000E+00	0.100E+01	MATERIAL PROPERTY						
		0.000E+00	0.300E+05	0.300E+05	0.300E+05	0.300E+00	0.300E+00	0.300E+00	0.300E+00	
		0.150E+05	0.150E+05	0.150E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	

1	3	1								
50.00		0.00	0.00	0.00						
2	3	1								
50.00		0.00	0.00	0.00						
3	3	1								
50.00		0.00	0.00	0.00						
4	3	1								
50.00		0.00	0.00	0.00						
5	3	1								
50.00		0.00	0.00	0.00						
6	3	1								
50.00		0.00	0.00	0.00						
7	3	1								
50.00		0.00	0.00	0.00						
8	3	1								
50.00		0.00	0.00	0.00						
1.000		1.000	1.000	1.000						
1.000		1.000	1.000	1.000						
1.000		1.000	1.000	1.000						
1.000		1.000	1.000	1.000						
1.000		1.000	1.000	1.000						
1	8	0	1	0	0	0.000	0	0	0	0 1 0 0 0
10	4	3	9	8	2	1 7				
2	8	0	1	0	0	0.000	0	0	0	0 2 0 0 0
16	10	9	15	14	8	7 13				
3	8	0	1	0	0	0.000	0	0	0	0 3 0 0 0
22	16	15	21	20	14	13 19				
4	8	0	1	0	0	0.000	0	0	0	0 4 0 0 0
28	22	21	27	26	20	19 25				
5	8	0	1	0	0	0.000	0	0	0	0 5 0 0 0
12	6	5	11	10	4	3 9				
6	8	0	1	0	0	0.000	0	0	0	0 6 0 0 0
18	12	11	17	16	10	9 15				
7	8	0	1	0	0	0.000	0	0	0	0 7 0 0 0
24	18	17	23	22	16	15 21				
8	8	0	1	0	0	0.000	0	0	0	0 8 0 0 0
30	24	23	29	28	22	21 27				
22	1	0.000E+00	-0.500E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
22	2	0.000E+00	-0.500E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
1.000		0.000	0.000	0.000						
1.000		0.000	0.000	0.000						

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 จุฬาลงกรณ์มหาวิทยาลัย

7.3.5 เพิ่มผลลัพธ์จาก"เซฟ 4"ที่ได้

If the ERROR occurred during an execution program SAP4.
Please attach to SAP4TEMP directory and delete the temporary files.

INPUT DATA FILE NAME THETSH8.DAT
THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.

CONTROL INFORMATION

NUMBER OF NODAL POINTS = 30
 NUMBER OF ELEMENT TYPES = 1
 NUMBER OF LOAD CASES = 2
 NUMBER OF FREQUENCIES = 0
 ANALYSIS CODE (NDYN) = 0
 EQ.0, STATIC
 EQ.1, MODAL EXTRACTION
 EQ.2, FORCED RESPONSE
 EQ.3, RESPONSE SPECTRUM
 EQ.4, DIRECT INTEGRATION
 SOLUTION MODE (MODEX) = 0
 EQ.0, EXECUTION
 EQ.1, DATA CHECK
 NUMBER OF SUBSPACE
 ITERATION VECTORS (NAD) = 0
 EQUATIONS PER BLOCK = 0
 TAPE10 SAVE FLAG (N10SV) = 0

NODAL POINT INPUT DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES				T
	X	Y	Z	XX	YY	ZZ	X	Y	Z		
1	1	1	1	0	0	0	5.000	5.000	0.000	0	0.000
2	1	1	1	0	0	0	5.000	7.000	0.000	0	0.000
3	1	1	1	0	0	0	5.000	5.000	-2.000	0	0.000
4	1	1	1	0	0	0	5.000	7.000	-2.000	0	0.000
5	1	1	1	0	0	0	5.000	5.000	-4.000	0	0.000
6	1	1	1	0	0	0	5.000	7.000	-4.000	0	0.000
7	0	0	0	0	0	0	2.691	6.541	0.000	0	0.000
8	0	0	0	0	0	0	2.691	8.541	0.000	0	0.000
9	0	0	0	0	0	0	2.691	6.541	-2.000	0	0.000
10	0	0	0	0	0	0	2.691	8.541	-2.000	0	0.000
11	0	0	0	0	0	0	2.691	6.541	-4.000	0	0.000
12	0	0	0	0	0	0	2.691	8.541	-4.000	0	0.000
13	0	0	0	0	0	0	0.062	7.071	0.000	0	0.000
14	0	0	0	0	0	0	0.062	9.071	0.000	0	0.000
15	0	0	0	0	0	0	0.062	7.071	-2.000	0	0.000
16	0	0	0	0	0	0	0.062	9.071	-2.000	0	0.000

17	0	0	0	0	0	0	0.062	7.071	-4.000	0	0.000
18	0	0	0	0	0	0	0.062	9.071	-4.000	0	0.000
19	0	0	0	0	0	0	-2.576	6.587	0.000	0	0.000
20	0	0	0	0	0	0	-2.576	8.587	0.000	0	0.000
21	0	0	0	0	0	0	-2.576	6.587	-2.000	0	0.000
22	0	0	0	0	0	0	-2.576	8.587	-2.000	0	0.000
23	0	0	0	0	0	0	-2.576	6.587	-4.000	0	0.000
24	0	0	0	0	0	0	-2.576	8.587	-4.000	0	0.000
25	1	1	1	0	0	0	-4.912	5.087	0.000	0	0.000
26	1	1	1	0	0	0	-4.912	7.087	0.000	0	0.000
27	1	1	1	0	0	0	-4.912	5.087	-2.000	0	0.000
28	1	1	1	0	0	0	-4.912	7.087	-2.000	0	0.000
29	1	1	1	0	0	0	-4.912	5.087	-4.000	0	0.000
30	1	1	1	0	0	0	-4.912	7.087	-4.000	0	0.000

1GENERATED NODAL DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	T
1	1	1	1	0	0	0	5.000	5.000	0.000	0.000
2	1	1	1	0	0	0	5.000	7.000	0.000	0.000
3	1	1	1	0	0	0	5.000	5.000	-2.000	0.000
4	1	1	1	0	0	0	5.000	7.000	-2.000	0.000
5	1	1	1	0	0	0	5.000	5.000	-4.000	0.000
6	1	1	1	0	0	0	5.000	7.000	-4.000	0.000
7	0	0	0	0	0	0	2.691	6.541	0.000	0.000
8	0	0	0	0	0	0	2.691	8.541	0.000	0.000
9	0	0	0	0	0	0	2.691	6.541	-2.000	0.000
10	0	0	0	0	0	0	2.691	8.541	-2.000	0.000
11	0	0	0	0	0	0	2.691	6.541	-4.000	0.000
12	0	0	0	0	0	0	2.691	8.541	-4.000	0.000
13	0	0	0	0	0	0	0.062	7.071	0.000	0.000
14	0	0	0	0	0	0	0.062	9.071	0.000	0.000
15	0	0	0	0	0	0	0.062	7.071	-2.000	0.000
16	0	0	0	0	0	0	0.062	9.071	-2.000	0.000
17	0	0	0	0	0	0	0.062	7.071	-4.000	0.000
18	0	0	0	0	0	0	0.062	9.071	-4.000	0.000
19	0	0	0	0	0	0	-2.576	6.587	0.000	0.000
20	0	0	0	0	0	0	-2.576	8.587	0.000	0.000
21	0	0	0	0	0	0	-2.576	6.587	-2.000	0.000
22	0	0	0	0	0	0	-2.576	8.587	-2.000	0.000
23	0	0	0	0	0	0	-2.576	6.587	-4.000	0.000
24	0	0	0	0	0	0	-2.576	8.587	-4.000	0.000
25	1	1	1	0	0	0	-4.912	5.087	0.000	0.000
26	1	1	1	0	0	0	-4.912	7.087	0.000	0.000
27	1	1	1	0	0	0	-4.912	5.087	-2.000	0.000
28	1	1	1	0	0	0	-4.912	7.087	-2.000	0.000
29	1	1	1	0	0	0	-4.912	5.087	-4.000	0.000
30	1	1	1	0	0	0	-4.912	7.087	-4.000	0.000

1EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	0	1	2	3
2	0	0	0	4	5	6
3	0	0	0	7	8	9
4	0	0	0	10	11	12
5	0	0	0	13	14	15
6	0	0	0	16	17	18
7	19	20	21	22	23	24

8	25	26	27	28	29	30
9	31	32	33	34	35	36
10	37	38	39	40	41	42
11	43	44	45	46	47	48
12	49	50	51	52	53	54
13	55	56	57	58	59	60
14	61	62	63	64	65	66
15	67	68	69	70	71	72
16	73	74	75	76	77	78
17	79	80	81	82	83	84
18	85	86	87	88	89	90
19	91	92	93	94	95	96
20	97	98	99	100	101	102
21	103	104	105	106	107	108
22	109	110	111	112	113	114
23	115	116	117	118	119	120
24	121	122	123	124	125	126
25	0	0	0	127	128	129
26	0	0	0	130	131	132
27	0	0	0	133	134	135
28	0	0	0	136	137	138
29	0	0	0	139	140	141
30	0	0	0	142	143	144

121 - NODE SOLID ELEMENT INPUT DATA

CONTROL INFORMATION

- NUMBER OF 21-NODE ELEMENTS = 8
- NUMBER OF MATERIAL SETS = 1
- MAXIMUM NUMBER OF MATERIAL TEMPERATURE INPUT POINTS = 1
- NUMBER OF MATERIAL AXIS ORIENTATION SETS = 0
- NUMBER OF DISTRIBUTED LOAD SETS = 8
- MAXIMUM NUMBER OF ELEMENT NODES = 8
- NUMBER OF STRESS OUTPUT SETS = 0
- R,S COORDINATE INTEGRATION ORDER = 2
- T COORDINATE INTEGRATION ORDER = 2

MATERIAL PROPERTY TABLES

- 0 MATERIAL NUMBER = (1)
- NUMBER OF TEMPERATURE POINTS = (1)
- WEIGHT DENSITY = (0.0000E+00)
- MASS /DENSITY = (0.1000E+01)
- IDENTIFICATION = (MATERIAL PROPERTY)



TEMPERATURE	E11	E22	E33	V12	V13	V23	G12	G13	G23	ALPHA-1	ALPHA-2	ALPHA-3
0.00	30000.0	30000.0	30000.0	0.300	0.300	0.300	15000.0	15000.0	15000.0	0.000E+00	0.000E+00	0.000E+00

DISTRIBUTED SURFACE LOAD TABLE

LOAD SET NUMBER = 1
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 2
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 3
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 4
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 5
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 6
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE	P(1)	P(2)	P(3)	P(4)
	50.000	50.000	50.000	50.000

LOAD SET NUMBER = 7
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1



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DISTRIBUTED PRESSURE P(1) P(2) P(3) P(4)
 50.000 50.000 50.000 50.000

LOAD SET NUMBER = 8
 LOAD SURFACE ELEMENT FACE = 3
 LOAD TYPE CODE = 1

DISTRIBUTED PRESSURE P(1) P(2) P(3) P(4)
 50.000 50.000 50.000 50.000

ELEMENT LOAD CASE MULTIPLIERS

	CASE A	CASE B	CASE C	CASE D
X-DIRECTION GRAVITY =	1.00	1.00	1.00	1.00
Y-DIRECTION GRAVITY =	1.00	1.00	1.00	1.00
Z-DIRECTION GRAVITY =	1.00	1.00	1.00	1.00
THERMAL LOADING =	1.00	1.00	1.00	1.00
PRESSURE LOADING =	1.00	1.00	1.00	1.00

13 / D 8 T O 2 1 NODE SOLID ELEMENT DATA

ELEMENT NUMBER	NODES -NDIS-	NODES -NXYZ-	MATL. TABLE NO.	MATL. AXES SET	STRESS OUTPUT SET	STRESS FREE TEMP.	NODE INC. -KG-	GAUSS PTS. -R,S-	GAUSS PTS. -T-	K-MATRIX RE-USE	LSA	LSB	LSC	LSD								
											-OR- N-1	-OR- N-2	-OR- N-3	-OR- N-4	N-5	N-6	N-7	N-8				
1	8	8	1	0	0	0.0	1	2	2	0	1	0	0	0	10	4	3	9	8	2	1	7
2	8	8	1	0	0	0.0	1	2	2	0	2	0	0	0	16	10	9	15	14	8	7	13
3	8	8	1	0	0	0.0	1	2	2	0	3	0	0	0	22	16	15	21	20	14	13	19
4	8	8	1	0	0	0.0	1	2	2	0	4	0	0	0	28	22	21	27	26	20	19	25
5	8	8	1	0	0	0.0	1	2	2	0	5	0	0	0	12	6	5	11	10	4	3	9
6	8	8	1	0	0	0.0	1	2	2	0	6	0	0	0	18	12	11	17	16	10	9	15
7	8	8	1	0	0	0.0	1	2	2	0	7	0	0	0	24	18	17	23	22	16	15	21
8	8	8	1	0	0	0.0	1	2	2	0	8	0	0	0	30	24	23	29	28	22	21	27

EQUATION PARAMETERS

TOTAL NUMBER OF EQUATIONS = 144
 BANDWIDTH = 57
 NUMBER OF EQUATIONS IN A BLOCK = 58
 NUMBER OF BLOCKS = 3

INODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
22	1	0.00000E+00	-0.50000E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
22	2	0.00000E+00	-0.50000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

STRUCTURE LOAD CASE ELEMENT LOAD MULTIPLIERS

LOAD CASE	A	B	C	D
1	1.000	0.000	0.000	0.000
2	1.000	0.000	0.000	0.000

INODE DISPLACEMENTS / ROTATIONS

NODE NUMBER	LOAD CASE	X-TRANSLATION	Y-TRANSLATION	Z-TRANSLATION	X-ROTATION	Y-ROTATION	Z-ROTATION
0	30	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	29	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	28	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	27	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	26	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	25	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	24	1	0.90740E-02	-0.25088E-01	-0.24129E-02	0.00000E+00	0.00000E+00
		2	0.10576E-01	-0.30772E-01	-0.12759E-02	0.00000E+00	0.00000E+00
0	23	1	-0.41064E-02	-0.22889E-01	-0.27040E-02	0.00000E+00	0.00000E+00
		2	-0.52220E-02	-0.29874E-01	-0.56448E-02	0.00000E+00	0.00000E+00
0	22	1	0.94179E-02	-0.25948E-01	-0.10415E-13	0.00000E+00	0.00000E+00
		2	0.10492E-01	-0.41586E-01	-0.12101E-13	0.00000E+00	0.00000E+00
0	21	1	-0.36849E-02	-0.22904E-01	-0.76744E-14	0.00000E+00	0.00000E+00
		2	-0.31812E-02	-0.31814E-01	-0.93606E-14	0.00000E+00	0.00000E+00
0	20	1	0.90740E-02	-0.25088E-01	0.24129E-02	0.00000E+00	0.00000E+00
		2	0.10576E-01	-0.30772E-01	0.12759E-02	0.00000E+00	0.00000E+00
0	19	1	-0.41064E-02	-0.22889E-01	0.27040E-02	0.00000E+00	0.00000E+00
		2	-0.52220E-02	-0.29874E-01	0.56448E-02	0.00000E+00	0.00000E+00
0	18	1	-0.38573E-03	-0.39866E-01	-0.35567E-02	0.00000E+00	0.00000E+00
		2	-0.14461E-02	-0.47783E-01	-0.38379E-02	0.00000E+00	0.00000E+00
0	17	1	-0.98663E-04	-0.38837E-01	-0.13092E-03	0.00000E+00	0.00000E+00
		2	0.89388E-03	-0.46294E-01	-0.95916E-04	0.00000E+00	0.00000E+00
0	16	1	-0.40699E-03	-0.38152E-01	-0.17064E-13	0.00000E+00	0.00000E+00
		2	-0.17963E-02	-0.44306E-01	-0.20100E-13	0.00000E+00	0.00000E+00
0	15	1	-0.15880E-04	-0.37523E-01	-0.16763E-13	0.00000E+00	0.00000E+00
		2	0.16237E-02	-0.45381E-01	-0.20300E-13	0.00000E+00	0.00000E+00
0	14	1	-0.38573E-03	-0.39866E-01	0.35567E-02	0.00000E+00	0.00000E+00
		2	-0.14461E-02	-0.47783E-01	0.38379E-02	0.00000E+00	0.00000E+00
0	13	1	-0.98663E-04	-0.38837E-01	0.13092E-03	0.00000E+00	0.00000E+00
		2	0.89388E-03	-0.46294E-01	0.95916E-04	0.00000E+00	0.00000E+00
0	12	1	-0.92371E-02	-0.24621E-01	-0.25727E-02	0.00000E+00	0.00000E+00
		2	-0.10601E-01	-0.27128E-01	-0.27508E-02	0.00000E+00	0.00000E+00

0	11	1	0.37995E-02	-0.22181E-01	-0.24386E-02	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.48093E-02	-0.24885E-01	-0.29106E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	10	1	-0.96235E-02	-0.24415E-01	-0.14443E-13	0.00000E+00	0.00000E+00	0.00000E+00
		2	-0.10983E-01	-0.27348E-01	-0.16827E-13	0.00000E+00	0.00000E+00	0.00000E+00
0	9	1	0.35346E-02	-0.21979E-01	-0.90900E-14	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.42866E-02	-0.24630E-01	-0.10806E-13	0.00000E+00	0.00000E+00	0.00000E+00
0	8	1	-0.92371E-02	-0.24621E-01	0.25727E-02	0.00000E+00	0.00000E+00	0.00000E+00
		2	-0.10601E-01	-0.27128E-01	0.27508E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	7	1	0.37995E-02	-0.22181E-01	0.24386E-02	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.48093E-02	-0.24885E-01	0.29106E-02	0.00000E+00	0.00000E+00	0.00000E+00
0	6	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	5	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	4	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	3	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	2	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	1	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

121 - NODE SOLID ELEMENT STRESS

ELEMENT	LOAD	LOCATION	SIG-XX	SIG-YY	SIG-ZZ	SIG-XY	SIG-YZ	SIG-ZX
1	1	1	-0.375592E+02	-0.299978E+02	-0.147490E+01	0.961392E+02	-0.514206E+00	-0.674968E+01
1	2	1	-0.472409E+02	-0.336887E+02	-0.304865E+01	0.105158E+03	-0.364682E+00	-0.769835E+01
2	1	1	-0.634467E+02	-0.433653E+02	0.577109E+00	0.344142E+02	0.229457E+00	0.433954E+01
2	2	1	-0.731284E+02	-0.416282E+02	0.155486E+01	0.434326E+02	-0.157975E+01	0.480260E+01
3	1	1	-0.640217E+02	-0.449906E+02	0.312921E+00	-0.314233E+02	0.183859E+01	-0.466047E+01
3	2	1	-0.737034E+02	-0.638438E+02	-0.559785E+00	-0.224049E+02	0.145067E+02	-0.841074E+01
4	1	1	-0.392217E+02	-0.320892E+02	-0.220516E+01	-0.998483E+02	0.109493E+01	0.712948E+01
4	2	1	-0.489034E+02	-0.563703E+02	-0.562937E+01	-0.147080E+03	0.157218E+02	0.127015E+02

5	1	1	-0.375592E+02	-0.299978E+02	-0.147490E+01	0.961392E+02	0.514206E+00	0.674968E+01
5	2	1	-0.472409E+02	-0.336887E+02	-0.304865E+01	0.105158E+03	0.364682E+00	0.769835E+01
6	1	1	-0.634467E+02	-0.433653E+02	0.577109E+00	0.344142E+02	-0.229457E+00	-0.433954E+01
6	2	1	-0.731284E+02	-0.416282E+02	0.155486E+01	0.434326E+02	0.157975E+01	-0.480260E+01
7	1	1	-0.640217E+02	-0.449906E+02	0.312921E+00	-0.314233E+02	-0.183859E+01	0.466047E+01
7	2	1	-0.737034E+02	-0.638438E+02	-0.559785E+00	-0.224049E+02	-0.145067E+02	0.841074E+01
8	1	1	-0.392217E+02	-0.320892E+02	-0.220516E+01	-0.998483E+02	-0.109493E+01	-0.712948E+01
8	2	1	-0.489034E+02	-0.563703E+02	-0.562937E+01	-0.147080E+03	-0.157218E+02	-0.127015E+02

STATIC SOLUTION TIME LOG

EQUATION SOLUTION = 1.41
 DISPLACEMENT OUTPUT = 0.70
 STRESS RECOVERY = 0.41

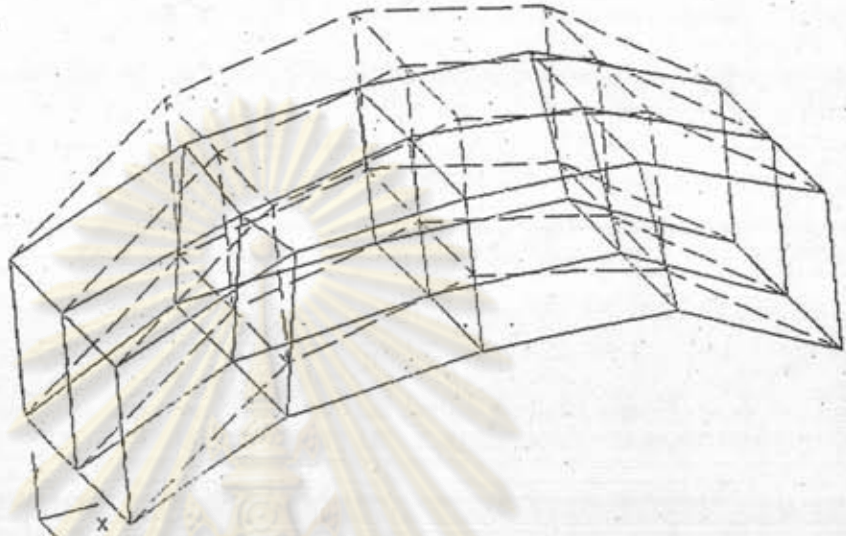
IOVERALL TIME LOG

NODAL POINT INPUT = 1.14
 ELEMENT STIFFNESS FORMATION = 2.34
 NODAL LOAD INPUT = 0.12
 TOTAL STIFFNESS FORMATION = 0.84
 STATIC ANALYSIS = 2.54
 EIGENVALUE EXTRACTION = 0.00
 FORCED RESPONSE ANALYSIS = 0.00
 RESPONSE SPECTRUM ANALYSIS = 0.00
 STEP-BY-STEP INTEGRATION = 0.00
 TOTAL SOLUTION TIME = 6.98

**** STOP

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50. 0000000X+00. 0000000X+00. 0000000X+00. 0000000X+00. 0000000X+00
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60. 0000000X+00. 0000000X+00. 0000000X+00. 0000000X+00. 0000000X+00
0. 0000000X+00
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0. 0000000X+00
8-. 9237099X-02-. 2462100X-010. 2572700X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
90. 3534600X-02-. 2197900X-01-. 9090000X-140. 0000000X+000. 0000000X+00
0. 0000000X+00
10-. 9623500X-02-. 2441500X-01-. 1444300X-130. 0000000X+000. 0000000X+00
0. 0000000X+00
110. 3799500X-02-. 2218100X-01-. 2438600X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
12-. 9237099X-02-. 2462100X-01-. 2572700X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
13-. 9866300X-04-. 3883700X-010. 1309200X-030. 0000000X+000. 0000000X+00
0. 0000000X+00
14-. 3857300X-03-. 3986600X-010. 3556700X-020. 0000000X+000. 0000000X+00
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18-. 3857300X-03-. 3986600X-01-. 3556700X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
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0. 0000000X+00
200. 9074001X-02-. 2508800X-010. 2412900X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
21-. 3684900X-02-. 2290400X-01-. 7674400X-140. 0000000X+000. 0000000X+00
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220. 9417901X-02-. 2594800X-01-. 1041500X-130. 0000000X+000. 0000000X+00
0. 0000000X+00
23-. 4106400X-02-. 2288900X-01-. 2704000X-020. 0000000X+000. 0000000X+00
0. 0000000X+00
240. 9074001X-02-. 2508800X-01-. 2412900X-020. 0000000X+000. 0000000X+00
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7.3.6.2 รูปและแผนผังการจัดที่ได้จากภาวะที่ 2



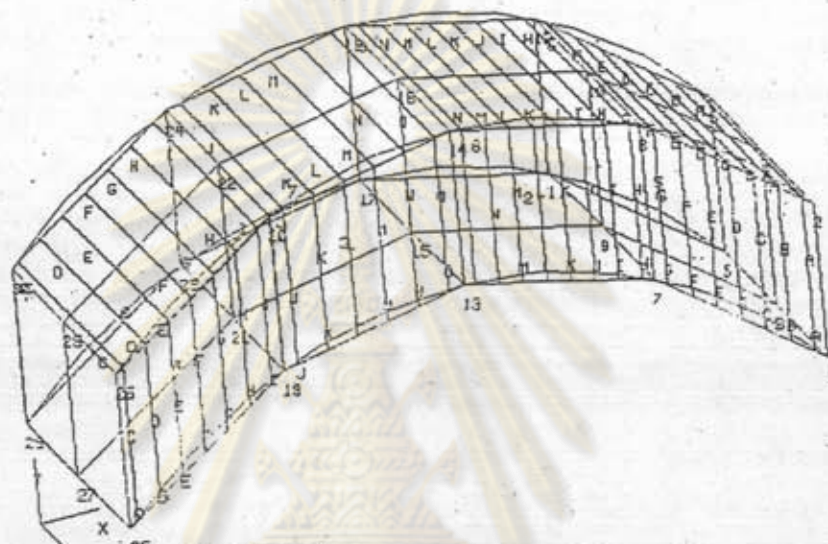
THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.
 COLS 1-X DISP., 2-Y DISP., 3-Z DISP., 4-X ROT., 5-Y ROT., 6-Z ROT.
 LOAD CASE NO. 2

THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.
 30 30 -0.477830E-01 18 6
 COLS 1-X DISP., 2-Y DISP., 3-Z DISP., 4-X ROT., 5-Y ROT., 6-Z ROT.
 LOAD CASE NO. 2
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8-. 10601000X-01-. 27128000X-010. 27508000X-020. 00000000X+000. 00000000X+000
0. 00000000X+00
90. 42866000X-02-. 24630000X-01-. 10806000X-130. 00000000X+000. 00000000X+000
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10-. 10983000X-01-. 27348000X-01-. 16827000X-130. 00000000X+000. 00000000X+000
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110. 48093000X-02-. 24885000X-01-. 29106000X-020. 00000000X+000. 00000000X+000
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12-. 10601000X-01-. 27128000X-01-. 27508000X-020. 00000000X+000. 00000000X+000
0. 00000000X+00
130. 89388000X-03-. 46294000X-010. 95915990X-040. 00000000X+000. 00000000X+000
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14-. 14461000X-02-. 47783000X-010. 38379000X-020. 00000000X+000. 00000000X+000
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150. 16237000X-02-. 45381000X-01-. 20300000X-130. 00000000X+000. 00000000X+000
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7.3.7 รูปและแน้มผลลัพธ์ที่เอเลเมนต์ที่ได้

7.3.7.1 รูปและแน้มผลลัพธ์ที่เอเลเมนต์ที่ได้จากภาวะที่ 1



-38.5	-	A
-31.4	-	B
-32.4	-	C
-33.3	-	D
-34.3	-	E
-35.2	-	F
-36.1	-	G
-37.1	-	H
-38.0	-	I
-39.0	-	J
-39.9	-	K
-40.9	-	L
-41.8	-	M
-42.8	-	N
-43.7	-	O

THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.
 COLS 1-SXX, 2-SYY, 3-SZZ, 4-SXY, 5-SYZ, 6-SZX
 LOAD CASE NO. 1

เมื่อพิจารณาค่าในคอลัมน์ความเค้นในแนว YY

THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.

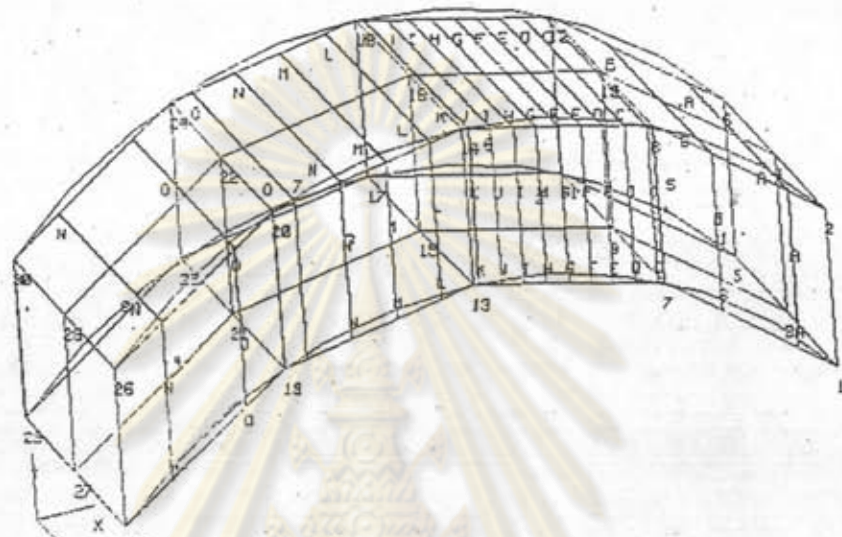
6

COLS 1-Sxx, 2-Syy, 3-Szz, 4-Sxy, 5-Syz, 6-Szx

LOAD CASE NO. 1

1	8	-	.3755920E+02	-	.2999780E+02	-	.1474900E+01	.9613921E+02	-	.5142061E+00	-	.6749680E+01
2	8	-	.6344670E+02	-	.4336530E+02	.5771090E+00	.3441420E+02	.2294570E+00	.4339540E+01			
3	8	-	.6402170E+02	-	.4499060E+02	.3129210E+00	-.3142330E+02	.1838590E+01	-.4660470E+01			
4	8	-	.3922170E+02	-	.3208920E+02	-.2205160E+01	-.9984830E+02	.1094930E+01	.7129480E+01			
5	8	-	.3755920E+02	-	.2999780E+02	-.1474900E+01	.9613921E+02	.5142061E+00	.6749680E+01			
6	8	-	.6344670E+02	-	.4336530E+02	.5771090E+00	.3441420E+02	-.2294570E+00	-.4339540E+01			
7	8	-	.6402170E+02	-	.4499060E+02	.3129210E+00	-.3142330E+02	-.1838590E+01	.4660470E+01			
8	8	-	.3922170E+02	-	.3208920E+02	-.2205160E+01	-.9984830E+02	-.1094930E+01	-.7129480E+01			

7.3.7.2 รูปและแผนผังผลลัพธ์ที่เอเลเมนต์ที่ได้จากภาระที่ 2



-34.6	-	H
-36.3	-	B
-38.1	-	C
-39.9	-	D
-41.6	-	E
-43.4	-	F
-45.1	-	G
-46.9	-	H
-48.7	-	I
-50.4	-	J
-52.2	-	K
-53.9	-	L
-55.7	-	M
-57.5	-	N
-59.2	-	O

THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.
 COLS 1-SXX, 2-SYY, 3-SZZ, 4-SXY, 5-SYZ, 6-SZX
 LOAD CASE NO. 2

เมื่อพิจารณาค่าในคอลัมน์ความเค้นในแนวแกน YY

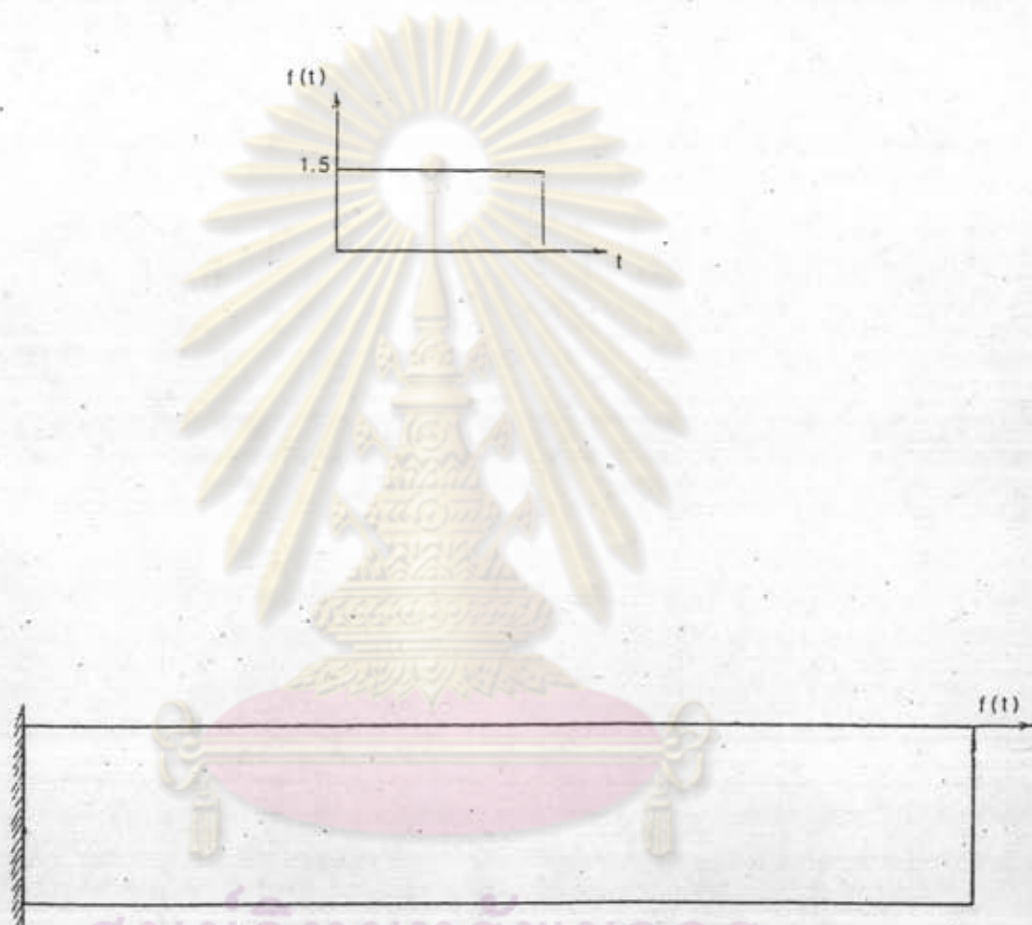
THIS IS THE THICK SHELL (HEX/8/2) FOR SAP IV.

6
 COLS 1-Sxx, 2-Syy, 3-Szz, 4-Sxy, 5-Syz, 6-Szx
 LOAD CASE NO. 2

1	8	-	4724090E+02	-	3368870E+02	-	3048650E+010	1051580E+03	-	3646820E+00	-	7698350E+01
2	8	-	7312840E+02	-	4162820E+020	1554860E+010	4343260E+02	1579750E+010	4802600E+01			
3	8	-	7370340E+02	-	6384380E+02	-	5597850E+00	2240490E+020	1450670E+02	-	8410740E+01	
4	8	-	4890340E+02	-	5637030E+02	-	5629370E+01	1470800E+030	1572180E+020	1270150E+02		
5	8	-	4724090E+02	-	3368870E+02	-	3048650E+010	1051580E+030	3646820E+000	7698350E+01		
6	8	-	7312840E+02	-	4162820E+020	1554860E+010	4343260E+020	1579750E+01	4802600E+01			
7	8	-	7370340E+02	-	6384380E+02	-	5597850E+00	2240490E+02	1450670E+020	8410740E+01		
8	8	-	4890340E+02	-	5637030E+02	-	5629370E+01	1470800E+03	1572180E+02	1270150E+02		



ตัวอย่างที่ 7.4 เป็นโครงสร้างเดียวกับในตัวอย่างที่ 1 ทุกประการ แต่รับภาระในแบบไดนามิกและวิเคราะห์ด้วยวิธีเรสพอนส์ฮิสโทรี ดังนี้



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

รูปทางโครงสร้าง

ดังนั้น การสร้างข้อมูลใน "พาแตรน" จึงเหมือนตัวอย่างที่ 1 ทุกประการ

แต่เมื่อ RUN ด้วย "CPL PSP ABEAM 1 " แล้ว จะได้

7.4.1 เพิ่มประเภท COMO

INPUT (NEUTRAL) FILE : ABEAMD2.DEF
 OUTPUT FILE (___ .DAT) : ABEAMD2.DAT
 STATIC (0) OR DYNAMIC (1) ANALYSIS
 1
 @@ PROCESSING NODE @@
 @@ PROCESSING ELEMENT @@

ELEMENT NO.	SHAPE CODE	VAR. CODE
1	4	0
2	4	0
3	4	0
4	4	0

 @@ PROCESSING MATERIAL PROPERTY @@
 @@ PROCESSING ELEMENT PROPERTY @@
 @@ PROCESSING NODE FORCE @@
 @@ PROCESSING NODE DISPLACEMENT @@
 READING IS COMPLETE, NOW IN WRITING PROCESS
 INPUT NUMBER OF FREQUENCY IN EIGEN VALUE SOLUTION 3
 INPUT ANALYSIS TYPE CODE (1,2,3,4)
 1 for EIGEN VALUE / VECTOR SOLUTION
 2 for FORCED DYNAMIC RESPONSE BY MODE SUPERPOSITION
 3 for RESPONSE SPECTRUM ANALYSIS
 4 for DIRECT STEP-BY-STEP INTEGRATION
 2
 / 2-D QUAD. /
 / CONCENTRATED LOAD /

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 จุฬาลงกรณ์มหาวิทยาลัย


```

-- D Y N A M I C   A N A L Y S I S --
MAXIMUM NUMBER OF ITERATIONS ALLOWED TO REACH THE CONVERGENCE TOLERANCE. (DEFAULT SET TO 16) [I3]
CUT OFF FREQUENCY (DEFAULT SET TO 0 (NO CUT OFF FREQ.)) (real) [E16.9]
NUMBER OF DIFFERENT TIME FUNCTION. [I5] 1
GROUND MOTION INDICATOR (0 OR 1)
    0 is no ground motion is input
    1 is read ground motion control card
0
NUMBER OF DIFFERENT ARRIVAL TIMES FOR THE FORCING FUNC. [I5] 0
TOTAL NUMBER OF SOLUTION TIME STEPS [I5] 200
SOLUTION TIME STEP, DELTA T (real) [E16.9].1
DAMPING FACTOR TO BE APPLIED TO ALL NF MODES (real) [E16.9] .2

DO YOU WANT TO CORRECT (Y/N) ? N
NODAL POINT NUMBER WHERE THE LOAD IS APPLIED
(input 0 for last card)9
DEGREE OF FREEDOM NUMBER (>= 1 AND <= 6) 3
TIME FUNCTION NUMBER [I5] 1
ARRIVAL TIME NUMBER [I5] 0

DO YOU WANT TO CORRECT (Y/N) ? N
NODAL POINT NUMBER WHERE THE LOAD IS APPLIED
(input 0 for last card)0

DO YOU WANT TO CORRECT (Y/N) ? N
FOR THE TIME FUNCTION NO. 1
NUMBER OF FUNCTION DEFINITION POINTS [I5] 2
TIME VALUE AT POINT (real) [E6.1] 1
0.
FUNCTION VALUE AT POINT (real) [E6.1] 1
1.5
TIME VALUE AT POINT (real) [E6.1] 2
.923
FUNCTION VALUE AT POINT (real) [E6.1] 2
1.5

DO YOU WANT TO CORRECT (Y/N) ? N

CHOOSE ONLY 2 FROM THESE FOLLOWING 5 GROUPS OF STRESS OUTPUT

STRESS OUTPUT AT POINT 0 (Y/N) ? Y
STRESS OUTPUT AT POINT 1 (Y/N) ? N
STRESS OUTPUT AT POINT 2 (Y/N) ? N
STRESS OUTPUT AT POINT 3 (Y/N) ? N
STRESS OUTPUT AT POINT 4 (Y/N) ? N
*** STOP

```

7.4.2 แฟ้มข้อมูลเข้าสำหรับ"แซฟ 4"ที่ได้

THIS IS THE ABEAM FOR SAP IV.

10	1	0	3	2	0						
1	1	1	1	0	0	0	0.000	0.000	0.000	0.000	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0.000	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0.000	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0.000	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0.000	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0.000	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0.000	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0.000	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0.000	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0.000	0.000

4	4	1	1	2							
1		0.000E+00	0.200E+01	0.000E+00							
		0.000	0.200E+06	0.210E+06	0.220E+06	0.300E+00	0.270E+00	0.250E+00	0.769E+05		
		0.000E+00	0.000E+00	0.000E+00							

		1.000	1.000	1.000	1.000	1.000					
		1.000	1.000	1.000	1.000	1.000					
		1.000	1.000	1.000	1.000	1.000					
		1.000	1.000	1.000	1.000	1.000					
1	1	2	3	4	1	0.000E+00	0.000E+00	0	0.100E+01		
2	4	3	5	6	1	0.000E+00	0.000E+00	0	0.100E+01		
3	6	5	7	8	1	0.000E+00	0.000E+00	0	0.100E+01		
4	8	7	9	10	1	0.000E+00	0.000E+00	0	0.100E+01		
3	1	0.000E+00-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
5	1	0.000E+00-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
7	1	0.000E+00-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
9	1	0.000E+00-0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		

		1.000	0.000	0.000	0.000						
0	1	16	0.100E-04	0.000E+00							
1	0	0	200	10	0.100E+00	0.200E+00					
9	3	1	0	1							

0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
 2 1 TIME-FUNCTION DEFINITION.
 .0E+00. 1E+01. 9E+03. 1E+01. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00. 0E+00.

2											
1	1	2	3	4	5	6					
2	1	2	3	4	5	6					
3	1	2	3	4	5	6					
4	1	2	3	4	5	6					
5	1	2	3	4	5	6					
6	1	2	3	4	5	6					
7	1	2	3	4	5	6					
8	1	2	3	4	5	6					
9	1	2	3	4	5	6					
10	1	2	3	4	5	6					

2											
1	1	2	3	4	0	0	0	0	0	0	0
2	1	2	3	4	0	0	0	0	0	0	0
3	1	2	3	4	0	0	0	0	0	0	0
4	1	2	3	4	0	0	0	0	0	0	0

7.4.3 เพิ่มผลลัพธ์จาก"แอฟ 4"ที่ได้

If the ERROR occurred during an execution program SAP4.
Please attach to SAP4TEMP directory and delete the temporary files.

INPUT DATA FILE NAME ABEAMD2.DAT
THIS IS THE ABEAM FOR SAP IV.

CONTROL INFORMATION

NUMBER OF NODAL POINTS = 10
 NUMBER OF ELEMENT TYPES = 1
 NUMBER OF LOAD CASES = 0
 NUMBER OF FREQUENCIES = 3
 ANALYSIS CODE (NDYN) = 2
 EQ.0, STATIC
 EQ.1, MODAL EXTRACTION
 EQ.2, FORCED RESPONSE
 EQ.3, RESPONSE SPECTRUM
 EQ.4, DIRECT INTEGRATION
 SOLUTION MODE (MODEX) = 0
 EQ.0, EXECUTION
 EQ.1, DATA CHECK
 NUMBER OF SUBSPACE
 ITERATION VECTORS (NAD) = 0
 EQUATIONS PER BLOCK = 0
 TAPE10 SAVE FLAG (N10SV) = 0

NODAL POINT INPUT DATA							NODAL POINT COORDINATES				
ONODE	BOUNDARY CONDITION CODES										
NUMBER	X	Y	Z	XX	YY	ZZ	X	Y	Z	T	
1	1	1	1	0	0	0	0.000	0.000	0.000	0	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0	0.000

1GENERATED NODAL DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	T
1	1	1	1	0	0	0	0.000	0.000	0.000	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0.000

1EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	0	1	2	3
2	0	0	0	4	5	6
3	7	8	9	10	11	12
4	13	14	15	16	17	18
5	19	20	21	22	23	24
6	25	26	27	28	29	30
7	31	32	33	34	35	36
8	37	38	39	40	41	42
9	43	44	45	46	47	48
10	49	50	51	52	53	54

1PLANE STRESS ANALYSIS

NUMBER OF ELEMENTS = 4
 NUMBER OF MATERIALS = 1
 MAXIMUM TEMPERATURES
 PER MATERIAL = 1
 ANALYSIS CODE = 2
 CODE FOR INCLUSION
 OF BENDING MODES = 0
 EQ. 0, INCLUDE
 GT. 0, SUPPRESS

MATERIAL I.D. NUMBER = 1
 NUMBER OF TEMPERATURES = 1
 WEIGHT DENSITY = 0.0000E+00
 MASS DENSITY = 0.2000E+01
 BETA ANGLE = 0.000

TEMPERATURE E(N) E(S) E(T) NU(NS) NU(NT) NU(ST) G(NS) ALPHA(N) ALPHA(S) ALPHA

0.00 0.2000E+06 0.2100E+06 0.2200E+06 0.3000 0.2700 0.2500 0.7690E+05 0.0000E+00 0.0000E+00 0.0000E

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ELEMENT LOAD MULTIPLIERS

LOAD CASE	TEMPERATURE			PRESSURE		X-GRAVITY	Y-GRAVITY	Z-GRAVITY			
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000			
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000			
C	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000			
D	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000			

ELEMENT NUMBER	I	J	K	L	MATL TYPE	REFERENCE TEMPERATURE	I-J FACE PRESSURE	STRESS OPTION	KG	THICKNESS
1	1	2	3	4	1	0.000	0.000E+00	4	1	1.0000
2	4	3	5	6	1	0.000	0.000E+00	4	1	1.0000
3	6	5	7	8	1	0.000	0.000E+00	4	1	1.0000
4	8	7	9	10	1	0.000	0.000E+00	4	1	1.0000

EQUATION PARAMETERS

TOTAL NUMBER OF EQUATIONS = 54
 BANDWIDTH = 20
 NUMBER OF EQUATIONS IN A BLOCK = 54
 NUMBER OF BLOCKS = 1

MODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
3	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
5	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
9	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

STRUCTURE LOAD CASE	ELEMENT LOAD MULTIPLIERS			
	A	B	C	D
1	1.000	0.000	0.000	0.000

EIGENVALUE ANALYSIS

DETERMINANT SEARCH SOLUTION IS CARRIED OUT

CONTROL INFORMATION

FLAG FOR ADDITIONAL PRINTING = 0
 EQ.0, SUPPRESS
 EQ.1, PRINT

STURM SEQUENCE CHECK FLAG (*) = 1
 EQ.0, PERFORM CHECK
 EQ.1, PASS

MAXIMUM ITERATION CYCLES (*) = 16

CONVERGENCE TOLERANCE (*) = 0.1000E-04

CUT-OFF FREQUENCY (CPS) = 0.1000E+09

NUMBER OF STARTING ITERATION
VECTORS TO BE READ FROM
TAPE10 (*) = 0

(*) APPLICABLE TO SUBSPACE
ITERATION SOLUTIONS ONLY

SOLUTION IS SOUGHT FOR FOLLOWING EIGENPROBLEM

NUMBER OF EQUATIONS = 54
HALF BANDWIDTH OF STIFFNESS MATRIX = 20
NUMBER OF EQUATION BLOCKS = 1
NUMBER OF EQUATIONS PER BLOCK = 54
NUMBER OF EIGENVALUES REQUIRED = 3

WE SOLVED FOR THE FOLLOWING EIGENVALUES

0 0.761621347539E+02 0.224006958080E+04 0.719010526983E+04

THE FOLLOWING ARE PHYSICAL ERROR BOUNDS ON THE EIGENPAIRS

0 0.101108295037E+01 0.869257227173E+00 0.930674864698E+00

1 PRINT OF FREQUENCIES

MODE NUMBER	CIRCULAR FREQUENCY (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
0 1	0.8727E+01	0.1389E+01	0.7200E+00
0 2	0.4733E+02	0.7533E+01	0.1328E+00
0 3	0.8479E+02	0.1350E+02	0.7410E-01

PRINT OF EIGENVECTORS

INODE DISPLACEMENTS / ROTATIONS

NODE NUMBER	EIGEN- VECTOR	X- TRANSLATION	Y- TRANSLATION	Z- TRANSLATION	X- ROTATION	Y- ROTATION	Z- ROTATION
0 10	1	0.00000E+00	0.55504E+00	0.64707E-01	0.00000E+00	0.00000E+00	0.00000E+00
	2	0.00000E+00	-0.41812E+00	-0.20556E+00	0.00000E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.16809E-02	0.40971E+00	0.00000E+00	0.00000E+00	0.00000E+00

0	9	1	0.00000E+00	0.55504E+00	-0.64707E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	-0.41812E+00	0.20556E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	-0.16809E-02	0.40971E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	8	1	0.00000E+00	0.36298E+00	0.62511E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.13602E+00	-0.14560E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.61976E-02	0.37747E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	7	1	0.00000E+00	0.36298E+00	-0.62511E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.13602E+00	0.14560E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	-0.61976E-02	0.37747E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	6	1	0.00000E+00	0.18646E+00	0.53266E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.36960E+00	-0.37376E-02	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.10582E-01	0.28825E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	5	1	0.00000E+00	0.18646E+00	-0.53266E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.36960E+00	0.37376E-02	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	-0.10582E-01	0.28825E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	4	1	0.00000E+00	0.53398E-01	0.32983E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.20076E+00	0.90381E-01	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.19771E-01	0.15261E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	3	1	0.00000E+00	0.53398E-01	-0.32983E-01	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.20076E+00	-0.90381E-01	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	-0.19771E-01	0.15261E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	2	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	1	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

EIGENSOLUTION TIME LOG

EIGENSOLUTION = 0.84
 PRINTING = 0.40

1

FORCED RESPONSE ANALYSIS

CONTROL INFORMATION

NUMBER OF TIME FUNCTIONS = 1
 GROUND MOTION INDICATOR = 0
 EQ.0, NONE
 EQ.1, GROUND INPUT
 NUMBER OF ARRIVAL TIMES = 1
 NUMBER OF TIME STEPS = 200
 OUTPUT PRINT INTERVAL = 10
 TIME STEP = 0.10000
 DAMPING FACTOR = 0.20000

DYNAMIC NODAL FORCES/MOMENTS

NODE NUMBER	NODAL DEGREE-OF FREEDOM	TIME FUNCTION NUMBER	ARRIVAL TIME NUMBER	TIME FUNCTION MULTIPLIER
9	3	1	1	0.1000E-01
0	0	0	1	0.0000E+00

ARRIVAL TIME VALUES

ENTRY ARRIVAL TIME
NUMBER VALUE

1 0.000000

1 TIME FUNCTION NUMBER = (1)

FUNCTION DESCRIPTION = (TIME FUNCTION DEFINITION.)

NUMBER OF ABSCISSAE = (2)

FUNCTION SCALE FACTOR = (0.1000E+01)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.00000	0.1000E+01	900.00000	0.1000E+01						

1 DISPLACEMENT COMPONENT
TIME HISTORY REQUESTS

NODE NODAL DEGREES OF FREEDOM
NUMBER * * * * *

1	1	2	3	4	5	6
2	1	2	3	4	5	6
3	1	2	3	4	5	6
4	1	2	3	4	5	6
5	1	2	3	4	5	6
6	1	2	3	4	5	6
7	1	2	3	4	5	6
8	1	2	3	4	5	6
9	1	2	3	4	5	6
10	1	2	3	4	5	6
0	0	0	0	0	0	0

CODE FOR OUTPUT TYPE = 2
EQ. 1, HISTORY TABLE
EQ. 2, PRINTER PLOT
EQ. 3, MAXIMA ONLY
PRINTER PLOT SPACING = 0

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INORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 1

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT. MAXIMUM	PLOT SYMBOL
1	4	0.0000E-01	0.0000E-01	1
1	5	0.0000E-01	0.0000E-01	2
1	6	0.0000E-01	0.0000E-01	3
2	4	0.0000E-01	0.0000E-01	4
2	5	0.0000E-01	0.0000E-01	5
2	6	0.0000E-01	0.0000E-01	6
3	1	0.0000E-01	0.0000E-01	7
3	2	3.0846E-07	2.0000E+00	8

ORDINATE



INORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 2

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
3	3	3.0140E-07	2.0000E+00	1
3	4	0.0000E-01	0.0000E-01	2
3	5	0.0000E-01	0.0000E-01	3
3	6	0.0000E-01	0.0000E-01	4
4	1	0.0000E-01	0.0000E-01	5
4	2	2.8593E-07	2.0000E+00	6
4	3	1.2749E-07	2.0000E+00	7
4	4	0.0000E-01	0.0000E-01	8

1

ORDINATE



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INORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 3

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
4	5	0.0000E-01	0.0000E-01	1
4	6	0.0000E-01	0.0000E-01	2
5	1	0.0000E-01	0.0000E-01	3
5	2	1.3481E-06	2.0000E+00	4
5	3	6.4799E-07	2.0000E+00	5
5	4	0.0000E-01	0.0000E-01	6
5	5	0.0000E-01	0.0000E-01	7
5	6	0.0000E-01	0.0000E-01	8



INORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 4

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
6	1	0.0000E-01	0.0000E-01	1
6	2	1.3360E-06	2.0000E+00	2
6	3	3.1951E-07	2.0000E+00	3
6	4	0.0000E-01	0.0000E-01	4
6	5	0.0000E-01	0.0000E-01	5
6	6	0.0000E-01	0.0000E-01	6
7	1	0.0000E-01	0.0000E-01	7
7	2	3.1518E-06	2.0000E+00	8



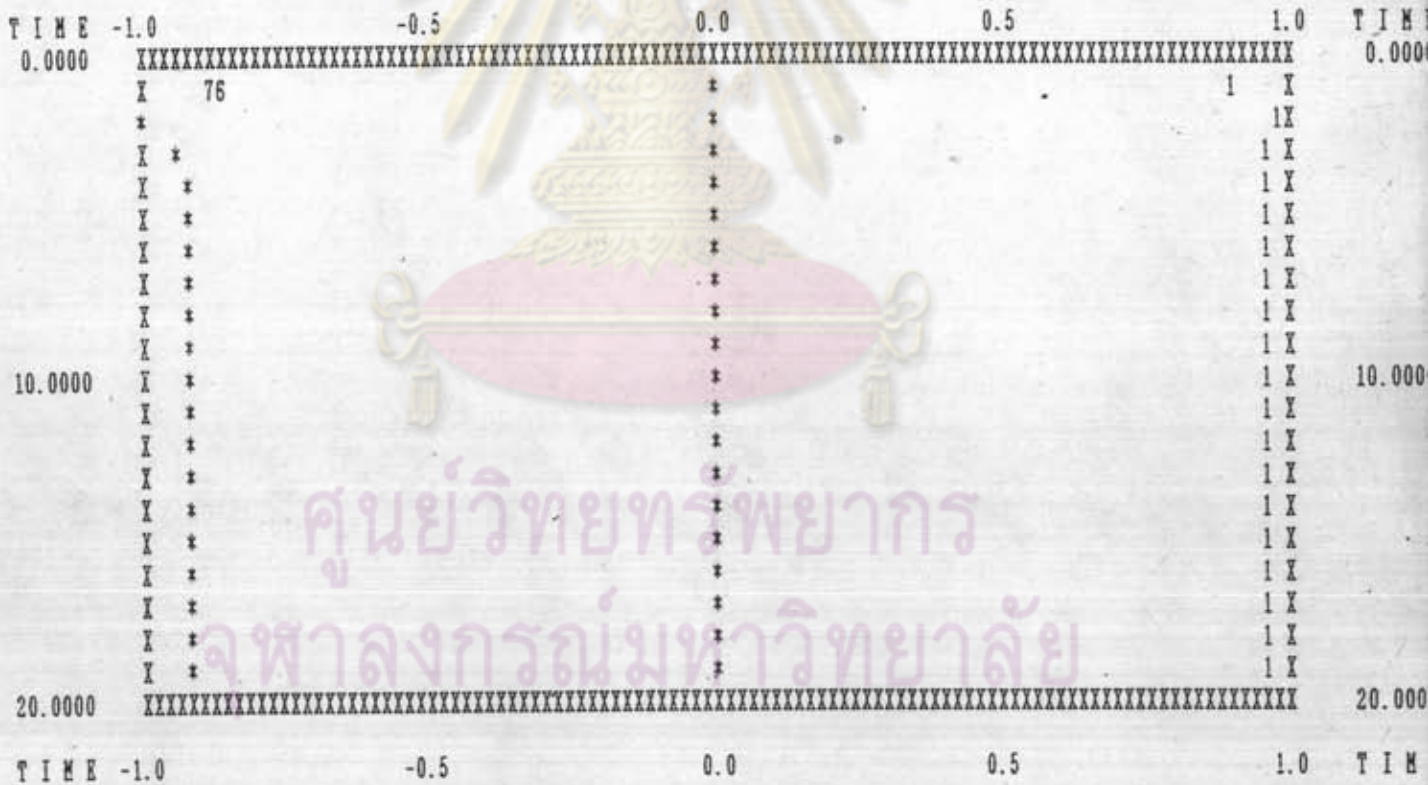
1NORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 5

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
7	3	9.1243E-07	2.0000E+00	1
7	4	0.0000E-01	0.0000E-01	2
7	5	0.0000E-01	0.0000E-01	3
7	6	0.0000E-01	0.0000E-01	4
8	1	0.0000E-01	0.0000E-01	5
8	2	3.1447E-06	2.0000E+00	6
8	3	4.8228E-07	2.0000E+00	7
8	4	0.0000E-01	0.0000E-01	8

1

ORDINATE



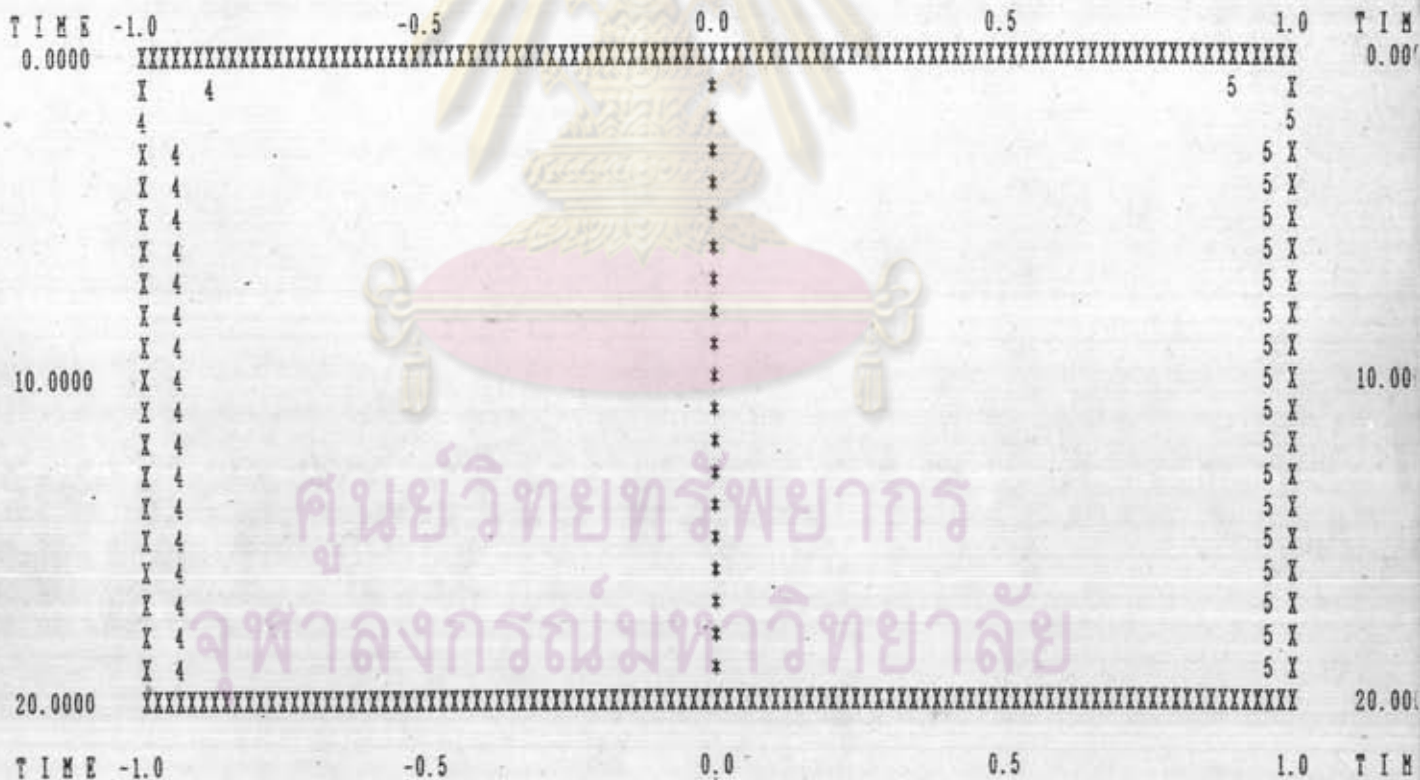
INORMALIZED DISPLACEMENT HISTORY PLOT

OUTPUT SET NUMBER = 6

NODE NUMBER	DISPLACEMENT COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
8	5	0.0000E-01	0.0000E-01	1
8	6	0.0000E-01	0.0000E-01	2
9	1	0.0000E-01	0.0000E-01	3
9	2	5.3899E-06	2.0000E+00	4
9	3	1.0057E-06	2.0000E+00	5
9	4	0.0000E-01	0.0000E-01	6
9	5	0.0000E-01	0.0000E-01	7
9	6	0.0000E-01	0.0000E-01	8

1

ORDINATE

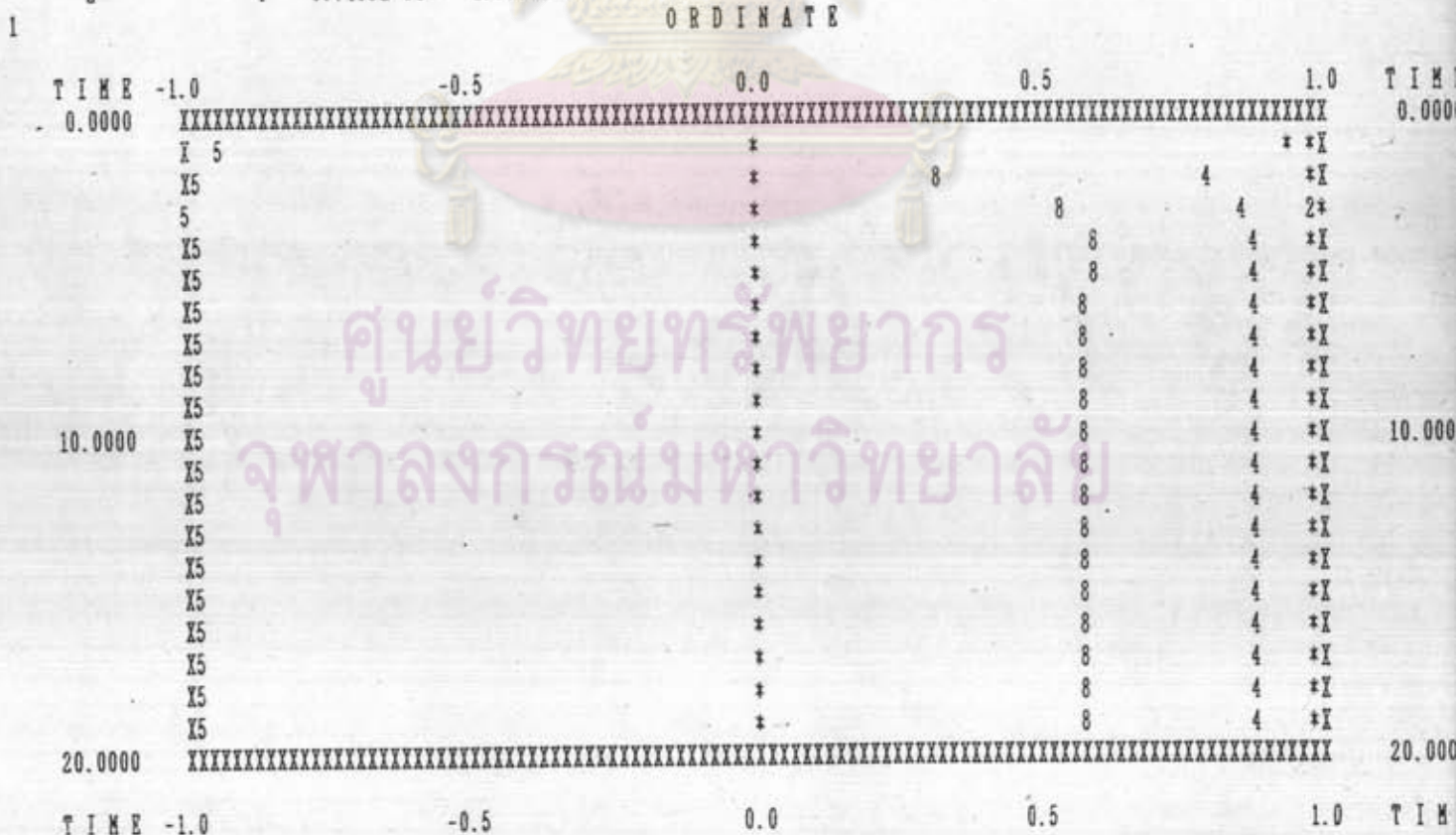


CODE FOR OUTPUT TYPE = 2
 EQ.1, HISTORY TABLE
 EQ.2, PRINTER PLOT
 EQ.3, MAXIMA ONLY
 PRINTER PLOT SPACING = 0

NORMALIZED STRESS HISTORY PLOT

ELEMENT TYPE NUMBER = 4
 OUTPUT SET NUMBER = 1

ELEMENT NUMBER	STRESS COMPONENT	MAXIMUM VALUE	TIME AT MAXIMUM	PLOT SYMBOL
1	1	1.3400E-03	3.0000E+00	1
1	2	1.2576E-02	3.0000E+00	2
1	3	0.0000E-01	0.0000E-01	3
1	4	1.5424E-03	1.0000E+00	4
2	1	4.0190E-04	3.0000E+00	5
2	2	1.0700E-02	3.0000E+00	6
2	3	0.0000E-01	0.0000E-01	7
2	4	3.7465E-04	1.0000E+00	8



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FORCED RESPONSE TIME LOG

FORM DYNAMIC LOADS.....	0.27
MODAL RESPONSE.....	0.14
DISPLACEMENT OUTPUT.....	3.56
STRESS OUTPUT.....	1.15
TOTAL FOR RESPONSE ANALYSIS...	5.12

OVERALL TIME LOG

NODAL POINT INPUT	=	0.45
ELEMENT STIFFNESS FORMATION	=	0.47
NODAL LOAD INPUT	=	0.11
TOTAL STIFFNESS FORMATION	=	0.15
STATIC ANALYSIS	=	0.00
EIGENVALUE EXTRACTION	=	1.25
FORCED RESPONSE ANALYSIS	=	5.14
RESPONSE SPECTRUM ANALYSIS	=	0.00
STEP-BY-STEP INTEGRATION	=	0.00
TOTAL SOLUTION TIME	=	7.57

**** STOP

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ตัวอย่างที่ 7.5 เป็นโครงสร้างเดียวกับในตัวอย่างที่ 1 ทุกประการ แต่รับภาระในแบบไดนามิกและวิเคราะห์ด้วยวิธีเรสปอนส์สเปกตรัม ดังนี้

ช่วงเวลา	การจัด
0	10
10	13
1000	15



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รูปทางโครงสร้าง

ดังนั้น การสร้างข้อมูลใน"พาแตรน"จึงเหมือนตัวอย่างที่ 1 ทุกประการ

แต่เมื่อ RUN ด้วย "CPL PSP ABEAM 1 0" แล้ว จะได้

7.5.1 แฟ้มประเภท COMO

```

INPUT (NEUTRAL) FILE : ABEAMD3.DEF
OUTPUT FILE (____.DAT) : ABEAMD3.DAT
STATIC (0) OR DYNAMIC (1) ANALYSIS
1
@@ PROCESSING NODE @@
@@ PROCESSING ELEMENT @@
ELEMENT NO.   SHAPE CODE  VAR. CODE
      1         4           0
      2         4           0
      3         4           0
      4         4           0

@@ PROCESSING MATERIAL PROPERTY @@
@@ PROCESSING ELEMENT PROPERTY @@
@@ PROCESSING NODE FORCE @@
@@ PROCESSING NODE DISPLACEMENT @@
READING IS COMPLETE, NOW IN WRITING PROCESS
INPUT NUMBER OF FREQUENCY IN EIGEN VALUE SOLUTION 3
INPUT ANALYSIS TYPE CODE (1,2,3,4)
  1 for EIGEN VALUE / VECTOR SOLUTION
  2 for FORCED DYNAMIC RESPONSE BY NODE SUPERPOSITION
  3 for RESPONSE SPECTRUM ANALYSIS
  4 for DIRECT STEP-BY-STEP INTEGRATION
3
/ 2-D Q U A D. /

/ CONCENTRATED LOAD /
-- DYNAMIC ANALYSIS --
MAXIMUM NUMBER OF ITERATIONS ALLOWED TO REACH THE CONVERGENCE TOLERANCE. (DEFAULT SET TO 16) [13]
CUT OFF FREQUENCY (DEFAULT SET TO 0 (NO CUT OFF FREQ.)) (real) [E16.9]
INPUT SPECTRUM TYPE (0 OR 1)
  0 is displacement VS. period
  1 is acceleration VS. period
0
NUMBER OF DEFINITION POINTS IN THE SPECTRUM TABLE [15] 3
PERIOD, T (real) [E16.9] 0.
VALUE OF DISPLACEMENT (real) [E10.2] 10.
PERIOD, T (real) [E16.9] 10.
VALUE OF DISPLACEMENT (real) [E10.2] 13.
PERIOD, T (real) [E16.9] 999.
VALUE OF DISPLACEMENT (real) [E10.2] 15.
**** STOP

```


7.5.3 เพิ่มผลลัพธ์จาก"แอฟ 4"ที่ได้

If the ERROR occurred during an execution program SAP4.
Please attach to SAP4TEMP directory and delete the temporary files.

INPUT DATA FILE NAME ABEAMD3.DAT
THIS IS THE ABRAM FOR SAP-IV.

CONTROL INFORMATION

NUMBER OF NODAL POINTS = 10
 NUMBER OF ELEMENT TYPES = 1
 NUMBER OF LOAD CASES = 0
 NUMBER OF FREQUENCIES = 3
 ANALYSIS CODE (NDYN) = 3
 EQ.0, STATIC
 EQ.1, MODAL EXTRACTION
 EQ.2, FORCED RESPONSE
 EQ.3, RESPONSE SPECTRUM
 EQ.4, DIRECT INTEGRATION
 SOLUTION MODE (MODEX) = 0
 EQ.0, EXECUTION
 EQ.1, DATA CHECK
 NUMBER OF SUBSPACE
 ITERATION VECTORS (NAD) = 0
 EQUATIONS PER BLOCK = 0
 TAPE10 SAVE FLAG (N10SV) = 0

NODAL POINT INPUT DATA

ONODE BOUNDARY CONDITION CODES

NODAL POINT COORDINATES

NUMBER	X	Y	Z	XX	YY	ZZ	I	J	K	L	T
1	1	1	1	0	0	0	0.000	0.000	0.000	0	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0	0.000

1GENERATED NODAL DATA

ONODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	T
1	1	1	1	0	0	0	0.000	0.000	0.000	0.000
2	1	1	1	0	0	0	0.000	1.000	0.000	0.000
3	0	0	0	0	0	0	0.000	1.000	1.500	0.000
4	0	0	0	0	0	0	0.000	0.000	1.500	0.000
5	0	0	0	0	0	0	0.000	1.000	3.000	0.000
6	0	0	0	0	0	0	0.000	0.000	3.000	0.000
7	0	0	0	0	0	0	0.000	1.000	4.500	0.000
8	0	0	0	0	0	0	0.000	0.000	4.500	0.000
9	0	0	0	0	0	0	0.000	1.000	6.000	0.000
10	0	0	0	0	0	0	0.000	0.000	6.000	0.000

1EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	0	1	2	3
2	0	0	0	4	5	6
3	7	8	9	10	11	12
4	13	14	15	16	17	18
5	19	20	21	22	23	24
6	25	26	27	28	29	30
7	31	32	33	34	35	36
8	37	38	39	40	41	42
9	43	44	45	46	47	48
10	49	50	51	52	53	54

1PLANE STRESS ANALYSIS

NUMBER OF ELEMENTS = 4
 NUMBER OF MATERIALS = 1
 MAXIMUM TEMPERATURES
 PER MATERIAL = 1
 ANALYSIS CODE = 2
 CODE FOR INCLUSION
 OF BENDING MODES = 0
 EQ. 0, INCLUDE
 GT. 0, SUPPRESS

MATERIAL I. D. NUMBER = 1
 NUMBER OF TEMPERATURES = 1
 WEIGHT DENSITY = 0.0000E+00
 MASS DENSITY = 0.2000E+01
 BETA ANGLE = 0.000

TEMPERATURE	E(N)	E(S)	E(T)	NU(NS)	NU(NT)	NU(ST)	G(NS)	ALPHA(N)	ALPHA(S)	ALPHA
0.00	0.2000E+06	0.2100E+06	0.2200E+06	0.3000	0.2700	0.2500	0.7690E+05	0.0000E+00	0.0000E+00	0.0000E

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ELEMENT LOAD MULTIPLIERS

LOAD CASE	TEMPERATURE	PRESSURE	X-GRAVITY	Y-GRAVITY	Z-GRAVITY
A	1.000	1.000	1.000	1.000	1.000
B	1.000	1.000	1.000	1.000	1.000
C	1.000	1.000	1.000	1.000	1.000
D	1.000	1.000	1.000	1.000	1.000

ELEMENT NUMBER	MATERIAL				REFERENCE TEMPERATURE	I-J FACE PRESSURE	STRESS OPTION	KG	THICKNESS	
	I	J	K	L TYPE						
1	1	2	3	4	1	0.000	0.000E+00	4	1	1.0000
2	4	3	5	6	1	0.000	0.000E+00	4	1	1.0000
3	6	5	7	8	1	0.000	0.000E+00	4	1	1.0000
4	8	7	9	10	1	0.000	0.000E+00	4	1	1.0000

EQUATION PARAMETERS

TOTAL NUMBER OF EQUATIONS = 54
 BANDWIDTH = 20
 NUMBER OF EQUATIONS IN A BLOCK = 54
 NUMBER OF BLOCKS = 1

NODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
3	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
5	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
9	1	0.00000E+00	-0.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

STRUCTURE LOAD CASE ELEMENT LOAD MULTIPLIERS

LOAD CASE	A	B	C	D
1	1.000	0.000	0.000	0.000

EIGENVALUE ANALYSIS

DETERMINANT SEARCH SOLUTION IS CARRIED OUT
 0

CONTROL INFORMATION

FLAG FOR ADDITIONAL PRINTING = 0
 EQ.0, SUPPRESS
 EQ.1, PRINT

STURM SEQUENCE CHECK FLAG (*) = 1
 EQ.0, PERFORM CHECK
 EQ.1, PASS

MAXIMUM ITERATION CYCLES (*) = 16

CONVERGENCE TOLERANCE (*) = 0.1000E-04

CUT-OFF FREQUENCY (CPS) = 0.1000E+09

NUMBER OF STARTING ITERATION
VECTORS TO BE READ FROM
TAPR10 (*) = 0

(*) APPLICABLE TO SUBSPACE
ITERATION SOLUTIONS ONLY

SOLUTION IS SOUGHT FOR FOLLOWING EIGENPROBLEM

NUMBER OF EQUATIONS = 54

HALF BANDWIDTH OF STIFFNESS MATRIX = 20

NUMBER OF EQUATION BLOCKS = 1

NUMBER OF EQUATIONS PER BLOCK = 54

NUMBER OF EIGENVALUES REQUIRED = 3

WE SOLVED FOR THE FOLLOWING EIGENVALUES

0 0.761621347539E+02 0.224006958080E+04 0.719010526983E+04

THE FOLLOWING ARE PHYSICAL ERROR BOUNDS ON THE EIGENPAIRS

0 0.101108295037E+01 0.869257227173E+00 0.930674864698E+00

PRINT OF FREQUENCIES

MODE NUMBER	CIRCULAR		
	FREQUENCY (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
0 1	0.8727E+01	0.1389E+01	0.7200E+00
0 2	0.4733E+02	0.7533E+01	0.1328E+00
0 3	0.8479E+02	0.1350E+02	0.7410E-01

PRINT OF EIGENVECTORS

INODE DISPLACEMENTS / ROTATIONS

NODE NUMBER	EIGEN-VECTOR	Y-TRANSLATION	Z-TRANSLATION	X-TRANSLATION	Y-ROTATION	Z-ROTATION
0	10	1	0.00000E+00	0.55504E+00	0.64707E-01	0.00000E+00
	2	0.00000E+00	-0.41812E+00	-0.20556E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.16809E-02	0.40971E+00	0.00000E+00	0.00000E+00
0	9	1	0.00000E+00	0.55504E+00	-0.64707E-01	0.00000E+00
	2	0.00000E+00	-0.41812E+00	0.20556E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	-0.16809E-02	0.40971E+00	0.00000E+00	0.00000E+00
0	8	1	0.00000E+00	0.36298E+00	0.62511E-01	0.00000E+00
	2	0.00000E+00	0.13602E+00	-0.14560E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.61976E-02	0.37747E+00	0.00000E+00	0.00000E+00
0	7	1	0.00000E+00	0.36298E+00	-0.62511E-01	0.00000E+00
	2	0.00000E+00	0.13602E+00	0.14560E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	-0.61976E-02	0.37747E+00	0.00000E+00	0.00000E+00
0	6	1	0.00000E+00	0.18646E+00	0.53266E-01	0.00000E+00
	2	0.00000E+00	0.36960E+00	-0.37376E-02	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.10582E-01	0.28825E+00	0.00000E+00	0.00000E+00
0	5	1	0.00000E+00	0.18646E+00	-0.53266E-01	0.00000E+00
	2	0.00000E+00	0.36960E+00	0.37376E-02	0.00000E+00	0.00000E+00
	3	0.00000E+00	-0.10582E-01	0.28825E+00	0.00000E+00	0.00000E+00
0	4	1	0.00000E+00	0.53398E-01	0.32983E-01	0.00000E+00
	2	0.00000E+00	0.20076E+00	0.90381E-01	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.19771E-01	0.15261E+00	0.00000E+00	0.00000E+00
0	3	1	0.00000E+00	0.53398E-01	-0.32983E-01	0.00000E+00
	2	0.00000E+00	0.20076E+00	-0.90381E-01	0.00000E+00	0.00000E+00
	3	0.00000E+00	-0.19771E-01	0.15261E+00	0.00000E+00	0.00000E+00
0	2	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	1	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

EIGENSOLUTION TIME LOG

EIGENSOLUTION = 0.81
 PRINTING = 0.40

RESPONSE SPECTRUM ANALYSIS

DIRECTION FACTORS

X = 1.0000 Y = 1.0000 Z = 1.0000

INDICATOR FOR DISPLACEMENT OR ACCELERATION SPECTRUM = 0

EQ.0 DISPLACEMENT
 EQ.1 ACCELERATION



MODAL PARTICIPATION FACTORS

MODE	X-DIRECTION	Y-DIRECTION	Z-DIRECTION
1	0.0000E+00	0.2641E+01	-0.1328E-12
2	0.0000E+00	0.1492E+01	0.3862E-08
3	0.0000E+00	0.9000E-11	0.3070E+01

SPECTRUM TABLE (SPECTRUM ANALYSIS)

NUMBER OF POINTS = 3
SCALE FACTOR = 0.10000E+01

INPUT POINT	PERIOD	SPECTRUM VALUE						
1	0.0000E+00	0.1000E+02						
2	0.1000E+02	0.1300E+02						
3	0.1000E+04	0.1500E+02						
NODE DISPLACEMENTS / ROTATIONS								
NODE NUMBER	MODE NUMBER	X-TRANSLATION	Y-TRANSLATION	Z-TRANSLATION	X-ROTATION	Y-ROTATION	Z-ROTATION	
0	10	1 0.0000E+00	0.1497E+02	0.17459E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	-0.62631E+01	-0.30791E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	0.51711E-01	0.12604E+02	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.16233E+02	0.13092E+02	0.0000E+00	0.0000E+00	0.0000E+00	
0	9	1 0.0000E+00	0.1497E+02	-0.17459E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	-0.62631E+01	0.30791E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	-0.51711E-01	0.12604E+02	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.16233E+02	0.13092E+02	0.0000E+00	0.0000E+00	0.0000E+00	
0	8	1 0.0000E+00	0.97935E+01	0.16866E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.20375E+01	-0.21809E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	0.19066E+00	0.11612E+02	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.10005E+02	0.11935E+02	0.0000E+00	0.0000E+00	0.0000E+00	
0	7	1 0.0000E+00	0.97935E+01	-0.16866E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.20375E+01	0.21809E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	-0.19066E+00	0.11612E+02	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.10005E+02	0.11935E+02	0.0000E+00	0.0000E+00	0.0000E+00	
0	6	1 0.0000E+00	0.50308E+01	0.14372E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.55363E+01	-0.55986E-01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	0.32555E+00	0.88676E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.74877E+01	0.89835E+01	0.0000E+00	0.0000E+00	0.0000E+00	
0	5	1 0.0000E+00	0.50308E+01	-0.14372E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.55363E+01	0.55986E-01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	-0.32555E+00	0.88676E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.74877E+01	0.89835E+01	0.0000E+00	0.0000E+00	0.0000E+00	
0	4	1 0.0000E+00	0.14407E+01	0.88992E+00	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.30072E+01	0.13538E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	0.60822E+00	0.46947E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.33896E+01	0.49664E+01	0.0000E+00	0.0000E+00	0.0000E+00	
0	3	1 0.0000E+00	0.14407E+01	-0.88992E+00	0.0000E+00	0.0000E+00	0.0000E+00	
		2 0.0000E+00	0.30072E+01	-0.13538E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		3 0.0000E+00	-0.60822E+00	0.46947E+01	0.0000E+00	0.0000E+00	0.0000E+00	
		4 0.0000E+00	0.33896E+01	0.49664E+01	0.0000E+00	0.0000E+00	0.0000E+00	

0	2	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0	1	1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

RESPONSE SPECTRUM STRESS COMPONENTS

SQUARE ROOT OF THE SUM OF THE SQUARES OF THE MODAL STRESSES
(FOR ALL ELEMENTS)

ELEMENT TYPE (AXISYMMETRIC) /// ELEMENT NUMBER (1).

V-S0	U-S0	T-S0	UV-S0
0.7234E+05	0.6790E+06	0.0000E+00	0.5036E+05

ELEMENT TYPE (AXISYMMETRIC) /// ELEMENT NUMBER (2)

V-S0	U-S0	T-S0	UV-S0
0.2170E+05	0.5777E+06	0.0000E+00	0.3028E+05

ELEMENT TYPE (AXISYMMETRIC) /// ELEMENT NUMBER (3)

V-S0	U-S0	T-S0	UV-S0
0.7164E+04	0.3864E+06	0.0000E+00	0.8346E+04

ELEMENT TYPE (AXISYMMETRIC) /// ELEMENT NUMBER (4)

V-S0	U-S0	T-S0	UV-S0
0.9635E+04	0.1359E+06	0.0000E+00	0.2111E+05

18. M. S. TIME LOG

COMPUTE MAXIMUM NODAL DISPLACEMENTS	=	0.21
OUTPUT MAXIMUM NODAL DISPLACEMENTS	=	0.43
COMPUTE ELEMENT STRESSES	=	0.15

TOTAL FOR SPECTRUM ANALYSIS	=	0.79
10 V E R A L L T I M E L O G		

NODAL POINT INPUT	=	0.46
ELEMENT STIFFNESS FORMATION	=	0.46
NODAL LOAD INPUT	=	0.12
TOTAL STIFFNESS FORMATION	=	0.14
STATIC ANALYSIS	=	0.00
EIGENVALUE EXTRACTION	=	1.22
FORCED RESPONSE ANALYSIS	=	0.00
RESPONSE SPECTRUM ANALYSIS	=	0.82
STEP-BY-STEP INTEGRATION	=	0.00

TOTAL SOLUTION TIME	=	3.22
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**** STOP

7.5.4 แผนผังการจัดที่ใต้

THIS IS THE ABEAM FOR SAP IV.

10 10 0.162330E+02 10 6
 COLS 1-Y DISP., 2-Y DISP., 3-Z DISP., 4-X ROT., 5-Y ROT., 6-Z ROT.

10.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
 0.0000000E+00
 20.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00.0000000E+00
 0.0000000E+00
 30.0000000E+00.3389600E+010.4966400E+010.0000000E+000.0000000E+00
 0.0000000E+00
 40.0000000E+00.3389600E+010.4966400E+010.0000000E+000.0000000E+00
 0.0000000E+00
 50.0000000E+00.7487700E+010.8983500E+010.0000000E+000.0000000E+00
 0.0000000E+00
 60.0000000E+00.7487700E+010.8983500E+010.0000000E+000.0000000E+00
 0.0000000E+00
 70.0000000E+00.1000500E+020.1193500E+020.0000000E+000.0000000E+00
 0.0000000E+00
 80.0000000E+00.1000500E+020.1193500E+020.0000000E+000.0000000E+00
 0.0000000E+00
 90.0000000E+000.1623300E+020.1309200E+020.0000000E+000.0000000E+00
 0.0000000E+00
 100.0000000E+000.1623300E+020.1309200E+020.0000000E+000.0000000E+00
 0.0000000E+00

ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย


ซึ่งสามารถพิจารณาในลักษณะของรูปภาพใต้ แต่ในที่นี้ไม่ได้นำมาแสดง

7.5.5 แฟ้มผลลัพธ์ที่เอเลเมนท์ได้

THIS IS THE ABRAK FOR SAP IV.

⁴
 COLS 1 V-S0, 2 U-S0, 3 T-S0, 4 UV-S0

1	4	0.7234000E+050.6790000E+060.0000000E+000.5036000E+05
2	4	0.2170000E+050.5777000E+060.0000000E+000.3028000E+05
3	4	0.7164000E+040.3864000E+060.0000000E+000.8346000E+04
4	4	0.9635000E+040.1359000E+060.0000000E+000.2111000E+05



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ซึ่งสามารถพิจารณาในลักษณะของรูปภาพได้ แต่ในที่นี้ไม่ได้นำมาแสดง