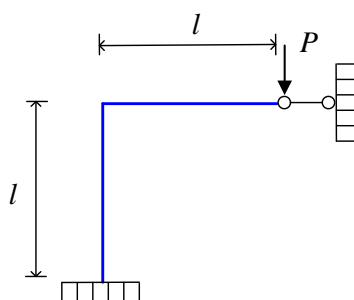
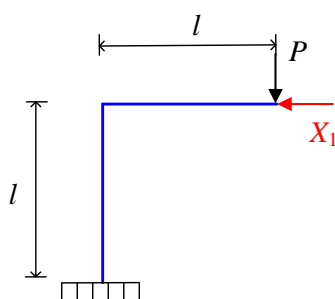


练习 1：绘制下图结构的弯矩图？



1. 力法结题步骤:

1.1. 确定基本体系

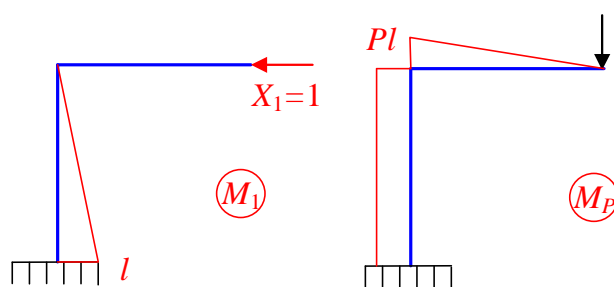


1.2. 写出位移条件、力法方程

$$\Delta_1 = 0$$

$$\delta_{11}X_1 + \Delta_{1P} = 0$$

1.3. 作单位弯矩图、荷载弯矩图



1.4. 求出系数和自由项

$$\delta_{11} = \frac{1}{EI} \left(\frac{1}{2} l^2 \cdot \frac{2}{3} l \right) = \frac{l^3}{3EI}$$

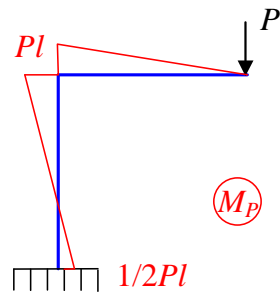
$$\Delta_{1P} = \frac{1}{EI} \left(-\frac{1}{2} l^2 \cdot Pl \right) = -\frac{Pl^3}{2EI}$$

1.5. 解力法方程

$$X_1 = \frac{3}{2} P (\leftarrow)$$

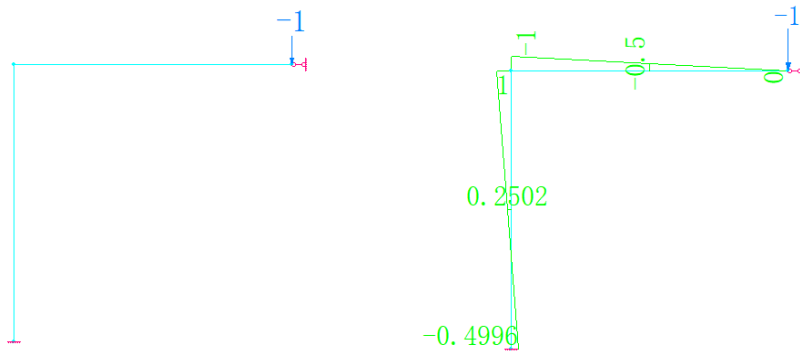
1.6. 叠加法作弯矩图

$$M = M_1 X_1 + M_p$$



2. SAP84 验证

2.1. SAP84 计算结果



内力组合1下梁柱单.

2.2. SAP84 数据文件

SYSTEM:

3 1 U= 1 0 UNIT=0

DPRINT

1 3

RESTRAINT

C 其它节点的约束

1 R=1 1 1 1 1 1

2 R=1 0 0 0 1 1

3 R=1 1 0 0 1 1

LOADS

3 L=1 F=0 0 -1 0 0 0

JOINT

1 C=0 0 0

2 C=0 0 1

3 C=0 1 1

FRAME

1 0 0 X=0 Y=0 Z=-1 O=2

1 A=10000 J=0.4 I=1 E=1 G=0.3846 W=0 M=0 C=0

C ----- Frame elements with no level or List by layer -----

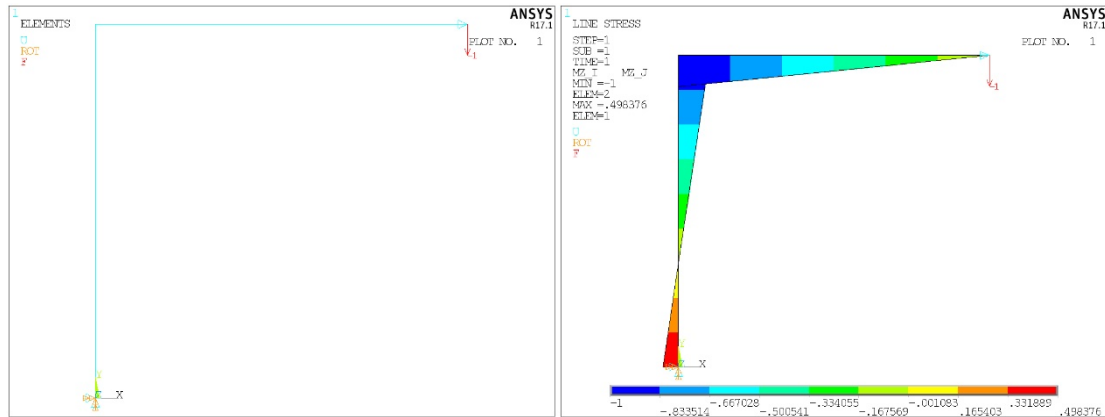
```

1 2 1 M=1 DIR3=1 0 0 T=1 E=0 0 R=0 0 0 0 0 0 L=0 ACT=1
2 2 3 M=1 DIR2=0 0 1 T=1 E=0 0 R=0 0 0 0 0 0 L=0 ACT=1

```

3. ANSYS 验证

3.1. ANSYS 计算结果



3.2. ANSYS 源程序

C*** Hongsheng ZHANG of HIT @ 2018

```

fini
/clear
!-----命令流区

fini
/prep7
!/vup,1,z
/view,1,0,0,1
/PLOPTS,DATE,0
wpstyl,,,,,0,,1

/RGB,INDEX,100,100,100,0
/RGB,INDEX,80,80,80,13
/RGB,INDEX,60,60,60,14
/RGB,INDEX,0,0,0,15

et,1,188
keyopt,1,3,2

mp,ex,1,1
mp,prxy,1,0.3

sectype, 1, beam, asec, sec, 0
secoffset, cent
secdata,10000,1,0,1,0,2,0,0,0,0,0,0

n,1,0
n,2,0,1
n,3,1,1
e,1,2
e,2,3

```

```
fini
/solu
d,1,all,0
d,3,ux,0
f,3,fy,-1
save
solve

fini
/post1

/pcb,u,,1
/pcb,rot,,1
/pcb,f,,2
/pcb,m,,2

epplot
/auto
/rep,fast
/show,jpeg,,0
jpeg,default
jpeg,qual,100
/rep
/show,close

etab,mz_i,smisc,3
etab,mz_j,smisc,16
p11s,mz_i,mz_j

/auto
/rep,fast
/show,jpeg,,0
jpeg,default
jpeg,qual,100
/rep
/show,close

/exit
/eof
```