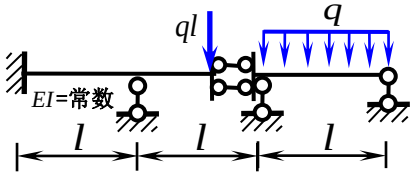
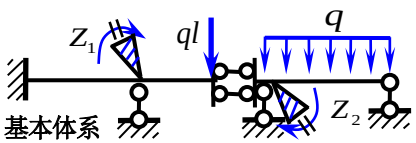
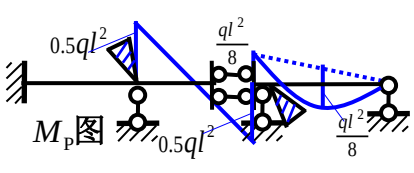
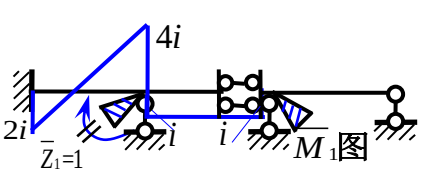
【例题1】用位移法作弯矩图。（梁1-4）









令线刚度：$i = EI/l$

$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

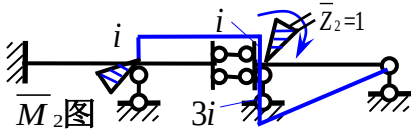
$k_{11} = 5i \quad k_{22} = 4i \quad k_{21} = k_{12} = -i$

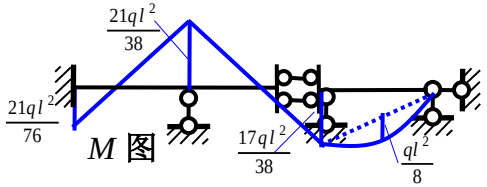
$F_{1P} = -ql^2/2 \quad F_{2P} = -5ql^2/8$

$5iZ_1 - iZ_2 - ql^2/2 = 0$

$-iZ_1 + 4iZ_2 - 5ql^2/8 = 0$

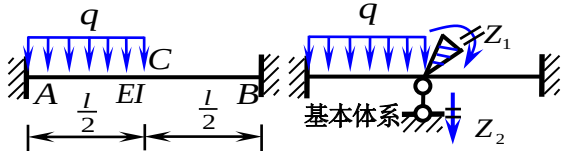
$Z_1 = \dfrac{21ql^2}{152i} \quad Z_2 = \dfrac{29ql^2}{152i}$

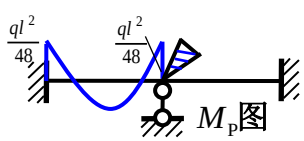


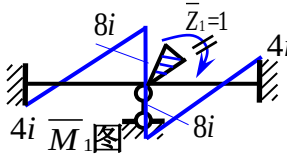


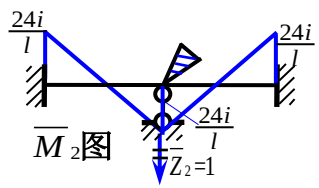
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

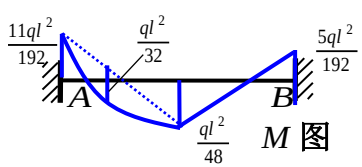
【例题2】用位移法作弯矩图。（梁1-9）











$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

$i = EI/l \quad k_{11} = 16i \quad k_{22} = 192i/l^2$

$k_{21} = k_{12} = 0 \quad F_{1P} = ql^2/48 \quad F_{2P} = -ql/4$

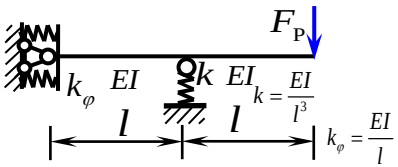
$16iZ_1 + ql^2/48 = 0$

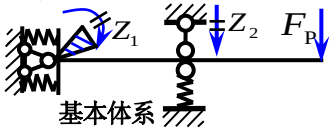
$192i/l^2 \, Z_2 - ql/4 = 0$

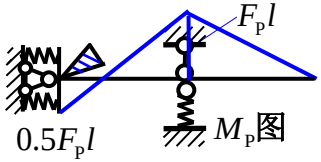
$Z_1 = \dfrac{-ql^2}{768i} \quad Z_2 = \dfrac{ql^3}{768i}$

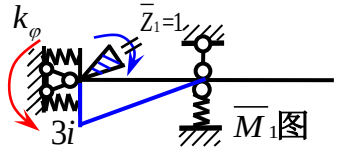
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

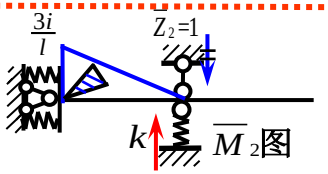
【例题3】用位移法作弯矩图。（梁1-20）











$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

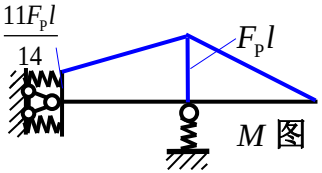
$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

$i = EI/l \quad k_{11} = 4i \quad k_{22} = 4i/l^2 \quad k_{21} = k_{12} = -3i/l \quad F_{1P} = 0.5F_P l \quad F_{2P} = -5F_P/2$

$4iZ_1 - 3i/l \, Z_2 + F_P l/2 = 0$

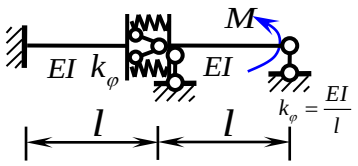
$-3i/l \, Z_1 + 4i/l^2 \, Z_2 - 5F_P/2 = 0$

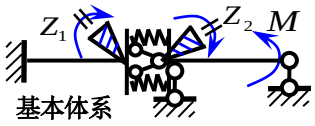
$Z_1 = 11F_P l/14i \quad Z_2 = 17F_P l^2/14i$

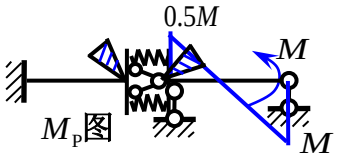


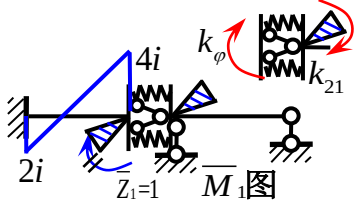
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

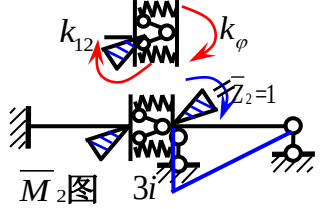
【例题4】用位移法作弯矩图。（梁1-22）











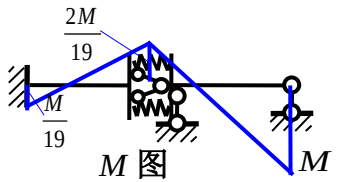
令线刚度：$i = EI/l$

$k_{11} = 4i + k_\varphi = 5i \quad k_{22} = 3i + k_\varphi = 4i$

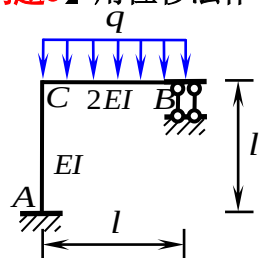
$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0 \quad k_{21} = k_{12} = -k_\varphi = -i \quad 5iZ_1 - iZ_2 = 0 \quad Z_1 = M/38i \quad Z_2 = 5M/38i$

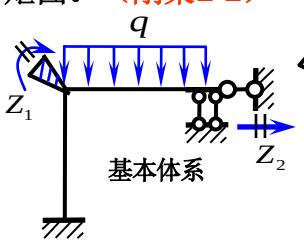
$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0 \quad F_{1P} = 0 \quad F_{2P} = -0.5M \quad -iZ_1 + 4iZ_2 - 0.5M = 0$

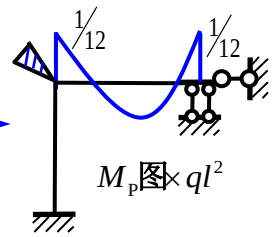
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

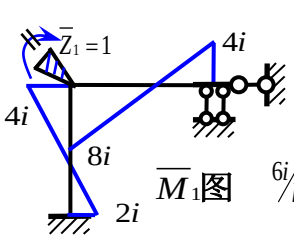


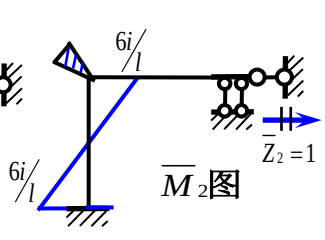
【例题5】用位移法作弯矩图。（刚架1-1）

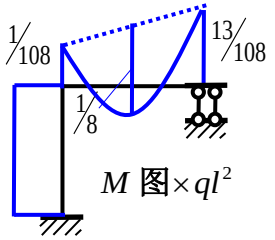












令线刚度：$i = EI/l$ $\quad k_{11} = 12i \quad k_{22} = 12i/l^2 \quad k_{21} = k_{12} = -6i/l$

$12iZ_1 - 6i/l\, Z_2 - ql^2/12 = 0 \quad Z_1 = ql^2/108i \quad Z_2 = ql^3/216i$

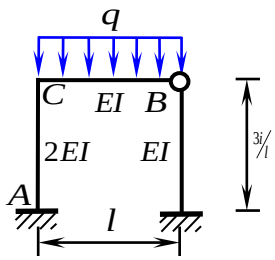
$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

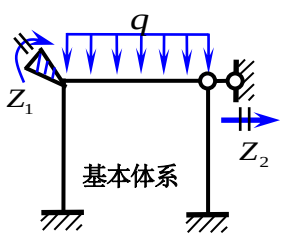
$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

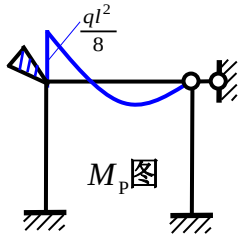
$F_{1P} = -ql^2/12 \quad F_{2P} = 0 \quad -6i/l\, Z_1 + 12i/l^2\, Z_2 = 0$

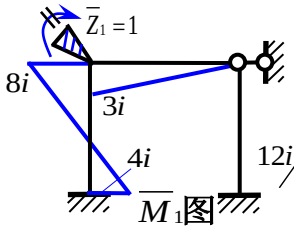
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

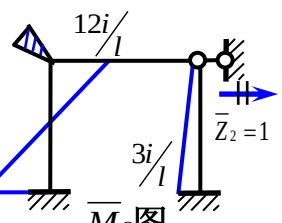
【例题6】用位移法作弯矩图。（刚架1-3）

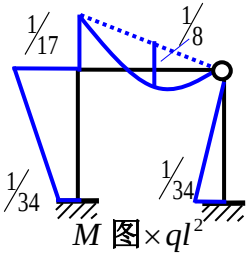












令线刚度：$i = EI/l$ $\quad k_{11} = 11i \quad k_{22} = 27i/l^2 \quad 11iZ_1 - 12i/l\, Z_2 - ql^2/8 = 0 \quad Z_1 = 3ql^2/136i \quad Z_2 = ql^3/102i$

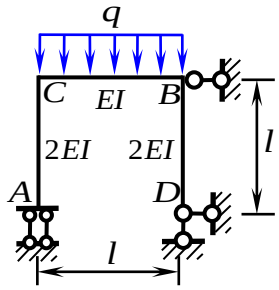
$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

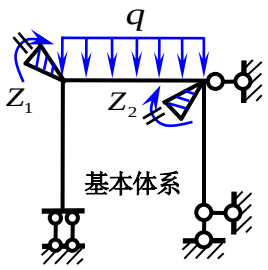
$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

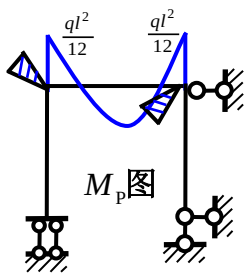
$k_{21} = k_{12} = -12i/l \quad F_{1P} = -ql^2/8 \quad F_{2P} = 0 \quad -12i/l\, Z_1 + 27i/l^2\, Z_2 = 0$

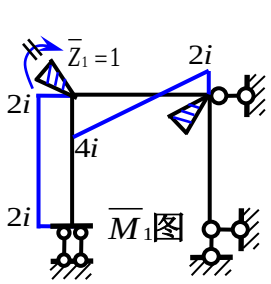
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

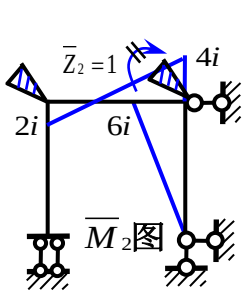
【例题7】用位移法作弯矩图。（刚架1-12）

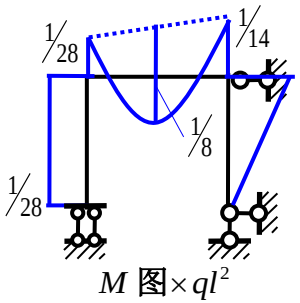








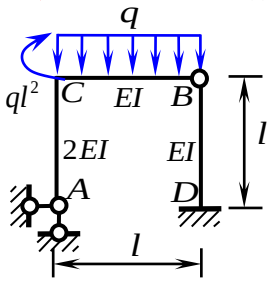


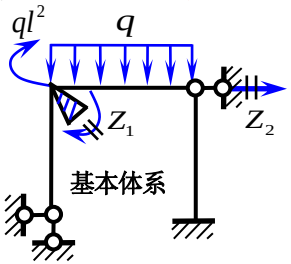


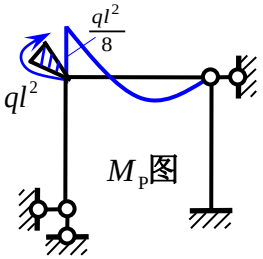
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=6i$　$k_{22}=10i$　$6iZ_1+2iZ_2-ql^2/12=0$　$Z_1=ql^2/56i$　$Z_2=-ql^2/84i$

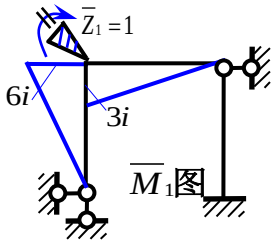
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$　$F_{1P}=-ql^2/12$　$F_{2P}=ql^2/12$　$2iZ_1+10iZ_2+ql^2/12=0$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

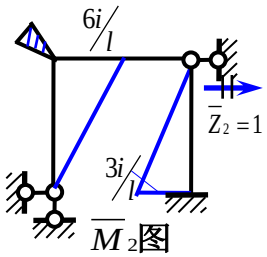
【例题8】用位移法作弯矩图。（刚架1-15）

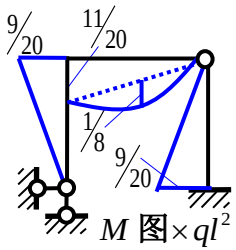








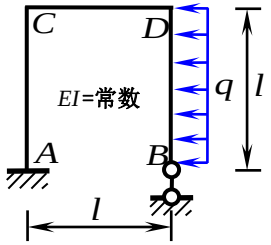


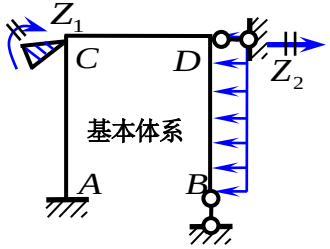


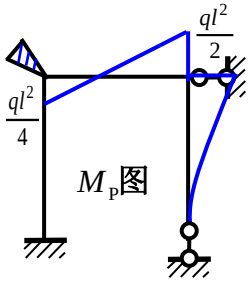
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=9i$　$k_{22}=9i/l^2$　$9iZ_1-6i/l\,Z_2-9ql^2/8=0$　$Z_1=9ql^2/40i$　$Z_2=3ql^3/20i$

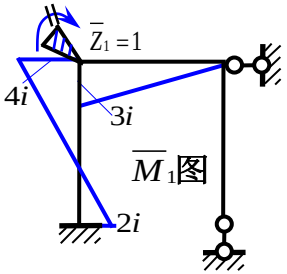
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=-6i/l$　$F_{1P}=-9ql^2/8$　$F_{2P}=0$　$-6i/l\,Z_1+9i/l^2\,Z_2=0$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

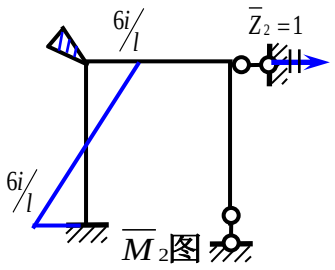
【例题9】用位移法作弯矩图。（刚架1-28）

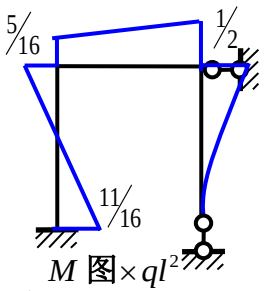








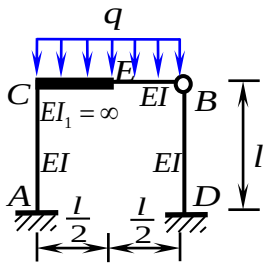


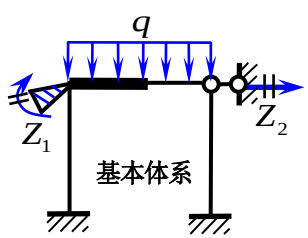


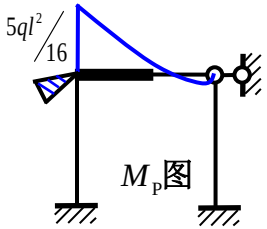
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=12i/l^2$　$7iZ_1-6i/l\,Z_2+ql^2/4=0$　$Z_1=-3ql^2/16i$　$Z_2=-17ql^3/96i$

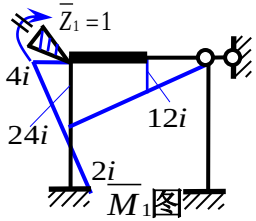
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=-6i/l$　$F_{1P}=ql^2/4$　$F_{2P}=ql$　$-6i/l\,Z_1+12i/l^2\,Z_2+ql=0$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

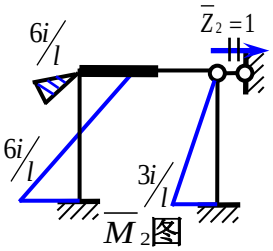
【例题10】用位移法作弯矩图。（刚架1-25）

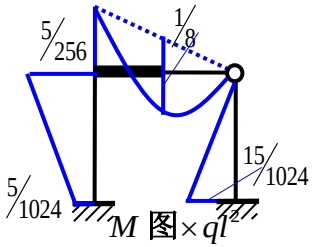












令线刚度：$i = EI/l$　　$k_{11} = 28i$　$k_{22} = 15i/l^2$

$k_{21} = k_{12} = -6i/l$

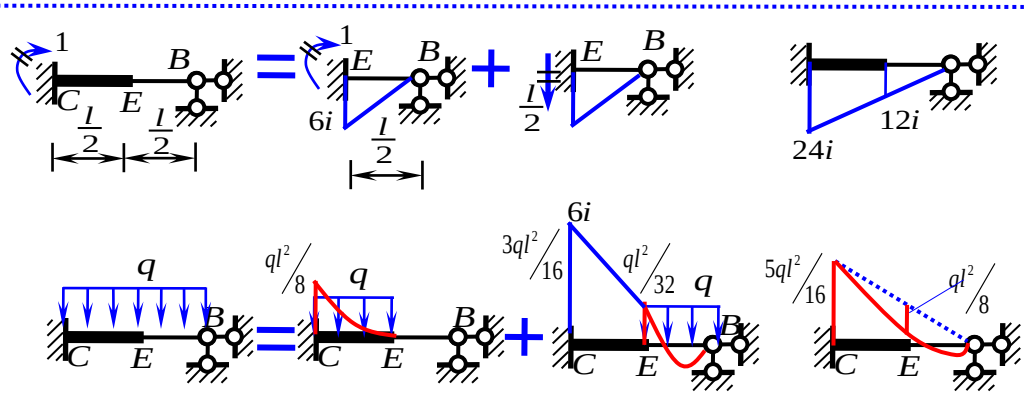
$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$　　$F_{1P} = -5ql^2/16$　　$F_{2P} = 0$

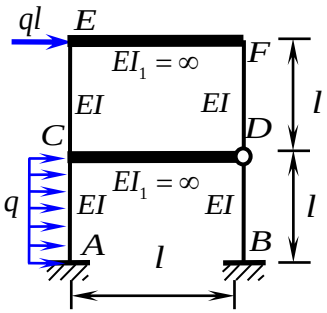
$28iZ_1 - 6i/l\ Z_2 - 5ql^2/16 = 0$　　$Z_1 = \dfrac{25ql^2}{2048i}$　　$Z_2 = \dfrac{5ql^3}{1024i}$

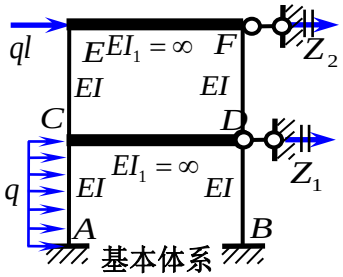
$-6i/l\ Z_1 + 15i/l^2\ Z_2 = 0$

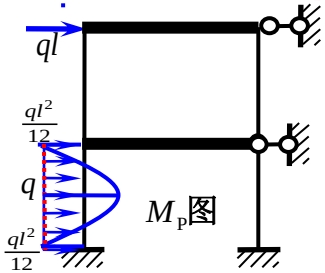
$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

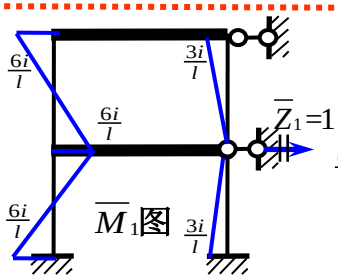


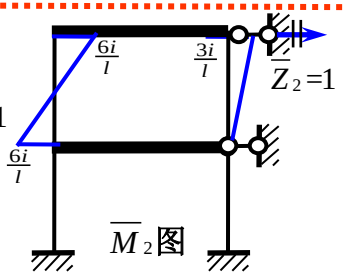
【例题11】用位移法作弯矩图。（刚架1-31）

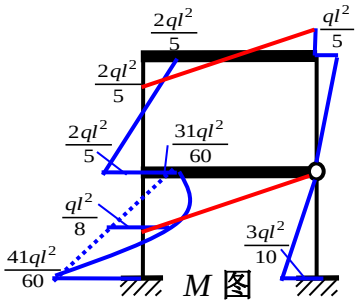












令线刚度：$i = EI/l$　　$k_{11} = 30i/l^2$　　$k_{22} = 15i/l^2$　　$k_{21} = k_{12} = -15i/l^2$　　$F_{1P} = -0.5ql$

$k_{11}Z_1 + k_{12}Z_2 + F_{1P} = 0$

$k_{21}Z_1 + k_{22}Z_2 + F_{2P} = 0$

$F_{2P} = -ql$

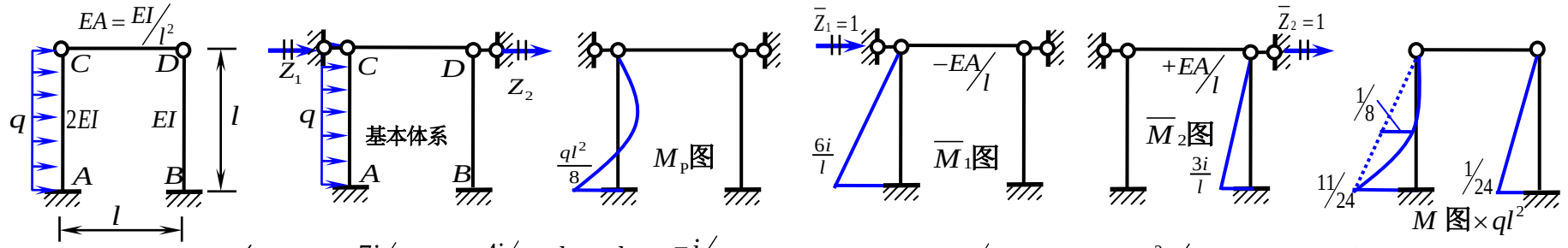
$30i/l^2\ Z_1 - 15i/l^2\ Z_2 - 0.5ql = 0$

$-15i/l^2\ Z_1 + 15i/l^2\ Z_2 - ql = 0$

$Z_1 = ql^3/10i$　　$Z_2 = ql^3/6i$

$M = \bar{M}_1 Z_1 + \bar{M}_2 Z_2 + M_P$

【例题12】用位移法作弯矩图。（刚架1-29）

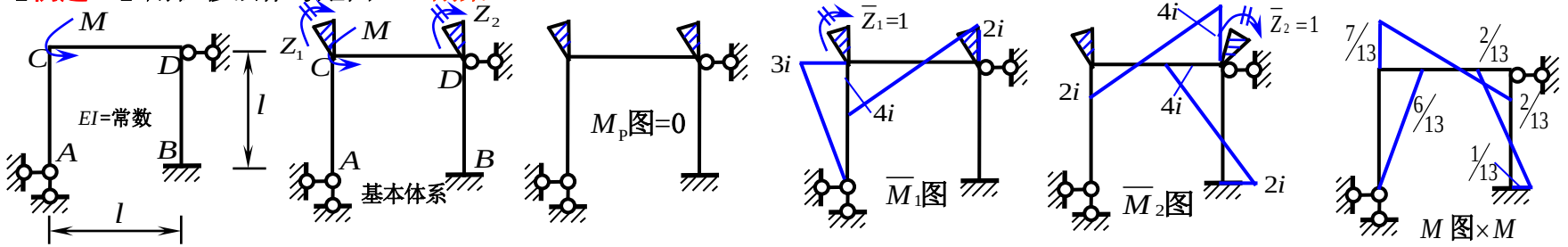


令线刚度：$i=EI/l$　$k_{11}=7i/l^2$　$k_{22}=4i/l^2$　$k_{21}=k_{12}=-i/l^2$　$7i/l^2\,Z_1-i/l^2\,Z_2-3ql/8=0$　$Z_1=ql^3/18i$　$Z_2=ql^3/72i$

$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　$F_{1P}=-3ql/8$　$F_{2P}=0$　$-i/l^2\,Z_1+4i/l^2\,Z_2=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

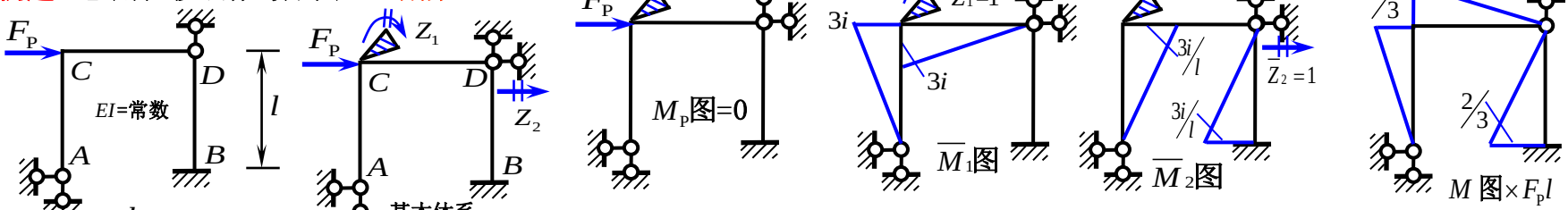
【例题13】用位移法作弯矩图。（刚架2-5）



$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=8i$　$7iZ_1+2iZ_2+M=0$　$Z_1=-2M/13i$　$Z_2=M/26i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$　$F_{1P}=M$　$F_{2P}=0$　$2iZ_1+8iZ_2=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

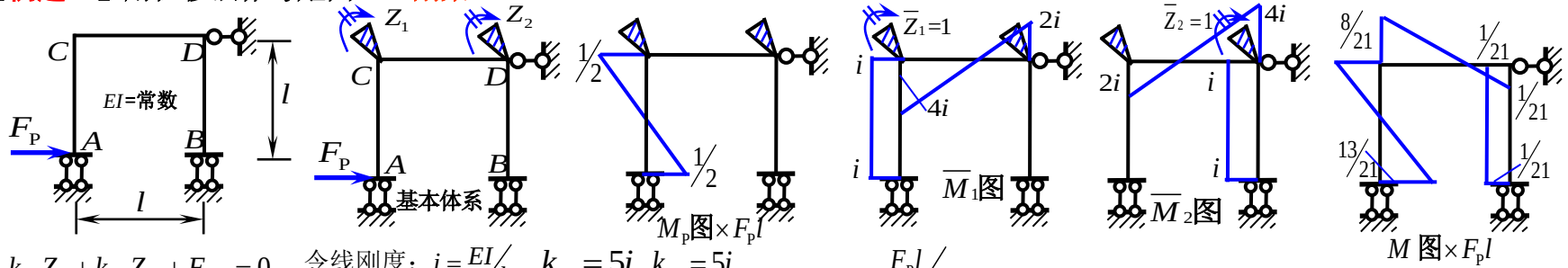
【例题14】用位移法作弯矩图。（刚架2-8）



$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=6i$　$k_{22}=6i/l^2$　$6iZ_1-3i/l\,Z_2=0$　$Z_1=F_Pl/9i$　$Z_2=2F_Pl^2/9i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=-3i/l$　$F_{1P}=0$　$F_{2P}=-F_P$　$-3i/l\,Z_1+6i/l^2\,Z_2-F_P=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

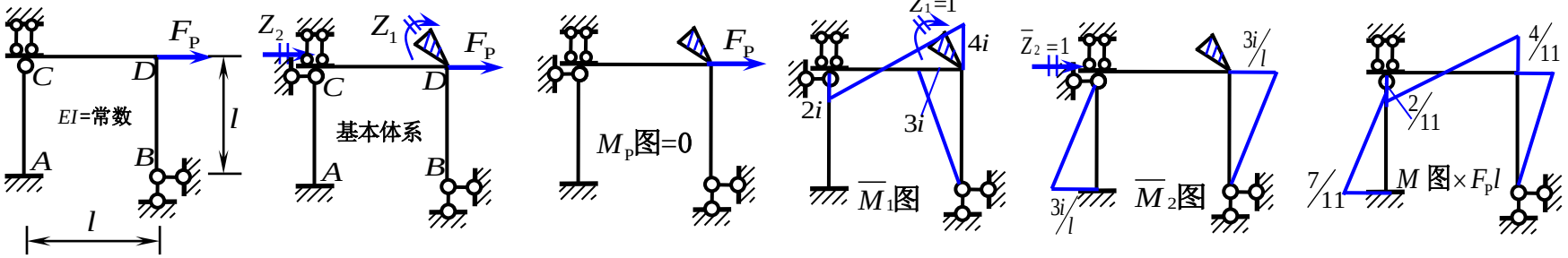
【例题15】用位移法作弯矩图。（刚架2-7）



$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$k_{22}=5i$　$5iZ_1+2iZ_2+F_P l/2=0$　$Z_1=-5F_P l/42i$　$Z_2=F_P l/21i$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$　$F_{1P}=F_P l/2$　$F_{2P}=0$　$2iZ_1+5iZ_2=0$

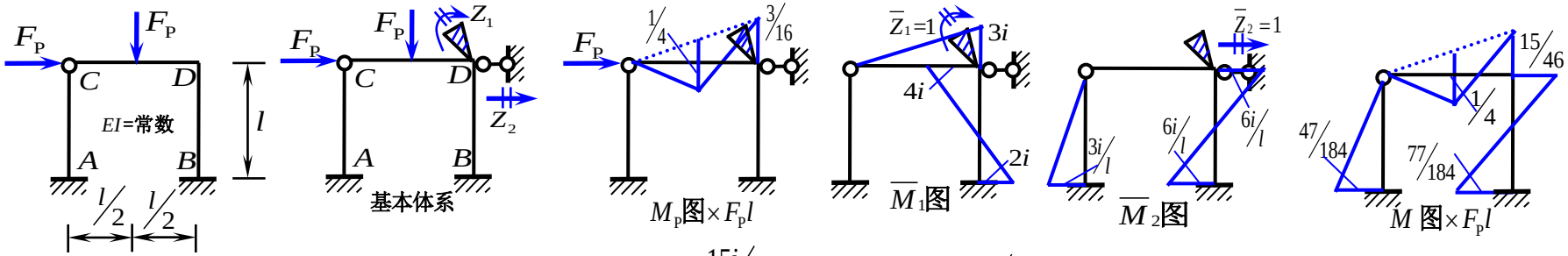
【例题16】用位移法作弯矩图。（刚架2-12）



$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=6i/l^2$　$7iZ_1-3i/l\,Z_2=0$　$Z_1=F_P l/11i$　$Z_2=7F_P l^2/33i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=-3i/l$　$F_{1P}=0$　$F_{2P}=-F_P$　$-3i/l\,Z_1+6i/l^2\,Z_2-F_P=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

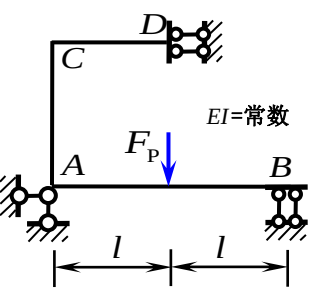
【例题17】用位移法作弯矩图。（刚架2-14）

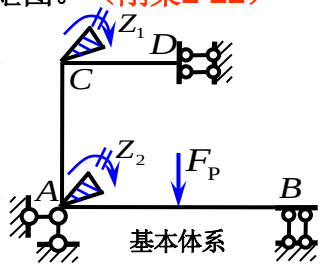


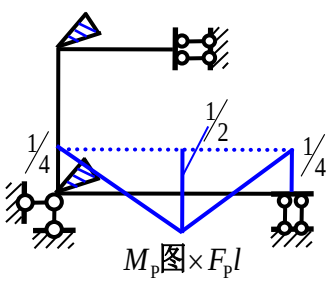
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=15i/l^2$　$7iZ_1-6i/l\,Z_2+3F_P l/16=0$　$Z_1=17F_P l/368i$　$Z_2=47F_P l^2/552i$

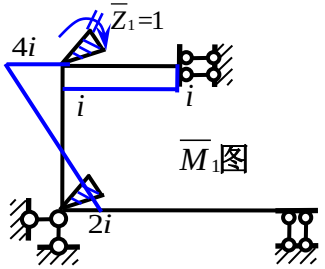
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=-6i/l$　$F_{1P}=3F_P l/16$　$F_{2P}=-F_P$　$-6i/l\,Z_1+15i/l^2\,Z_2-F_P=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

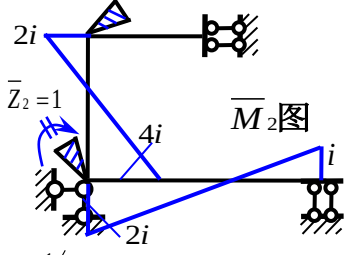
【例题18】用位移法作弯矩图。（刚架2-22）

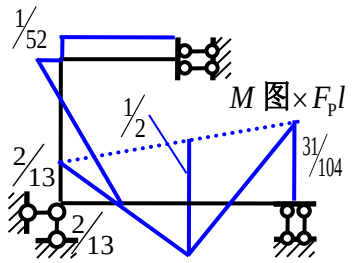








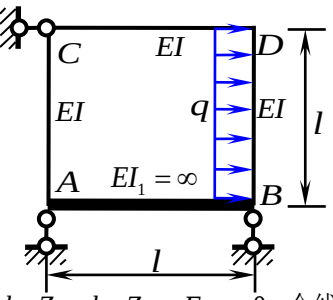


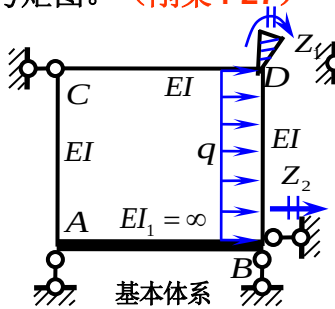


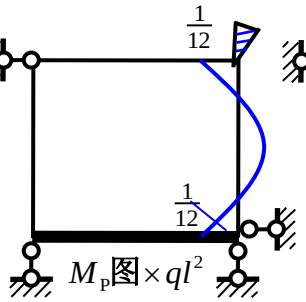
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$k_{22}=6i$　$5iZ_1+2iZ_2=0$　$Z_1=\dfrac{-F_P l}{52i}$　$Z_2=\dfrac{5F_P l}{104i}$

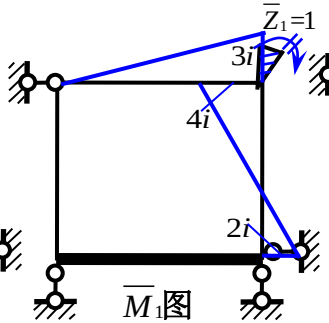
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$　$F_{1P}=0$　$F_{2P}=-F_P l/4$　$2iZ_1+6iZ_2-F_P l/4=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

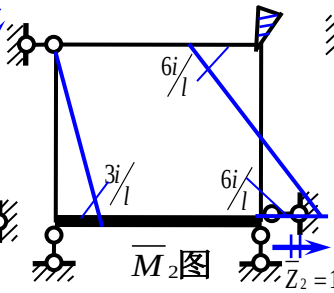
【例题19】用位移法作弯矩图。（刚架4-27）

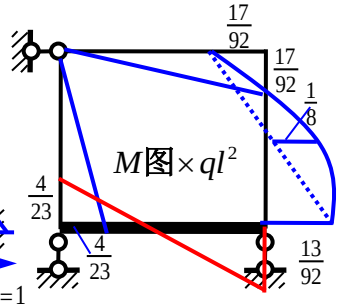








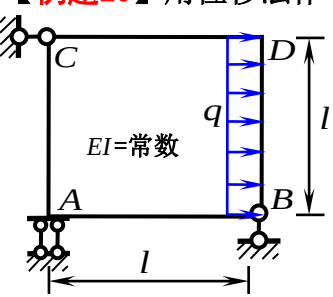


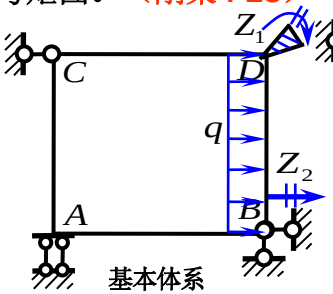


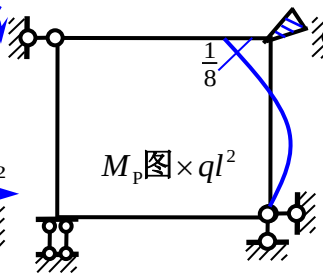
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=15i/l^2$　$7iZ_1+6i/l\,Z_2+ql^2/12=0$　$Z_1=\dfrac{-17ql^2}{276i}$　$Z_2=\dfrac{4ql^3}{69i}$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

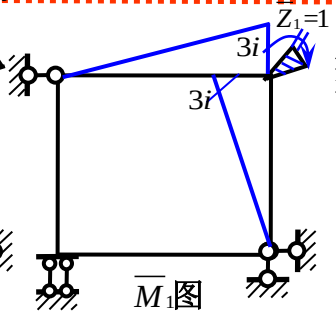
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=6i/l$　$F_{1P}=ql^2/12$　$F_{2P}=-ql/2$　$6i/l\,Z_1+15i/l^2\,Z_2-ql/2=0$

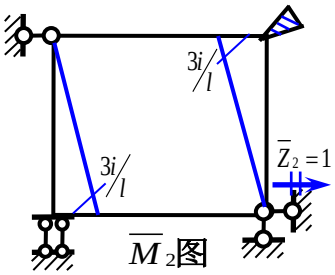
【例题20】用位移法作弯矩图。（刚架4-28）

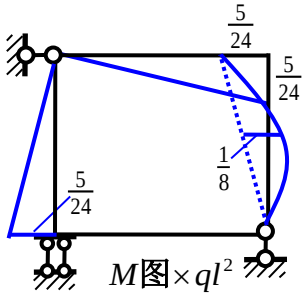








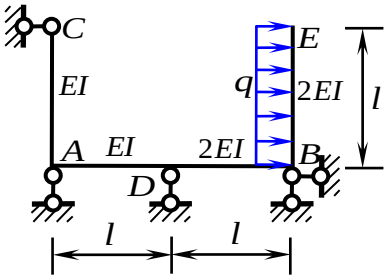


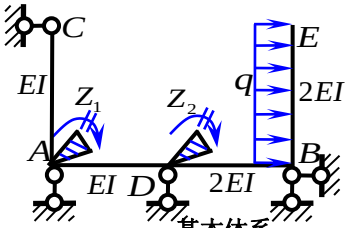


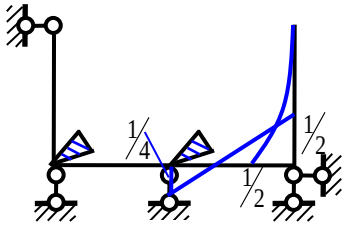
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=6i$　$k_{22}=6i/l^2$　$6iZ_1+3i/l\,Z_2+ql^2/8=0$　$Z_1=\dfrac{-5ql^2}{72i}$　$Z_2=\dfrac{7ql^3}{72i}$

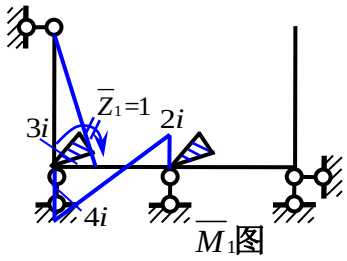
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=3i/l$　$F_{1P}=ql^2/8$　$F_{2P}=-3ql/8$　$3i/l\,Z_1+6i/l^2\,Z_2-3ql/8=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

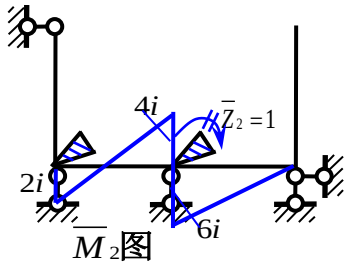
【例题21】用位移法作弯矩图。（刚架4-21）











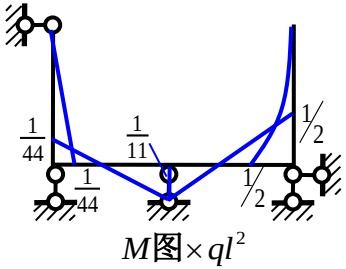
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

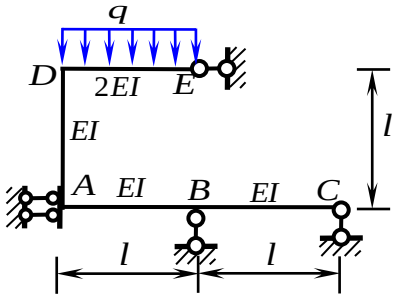
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=10i$　$7iZ_1+2iZ_2=0$

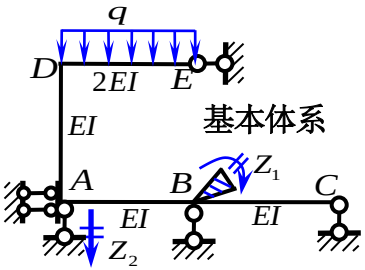
$k_{21}=k_{12}=2i$　$F_{1P}=0$　$F_{2P}=ql^2/4$　$2iZ_1+10iZ_2+ql^2/4=0$

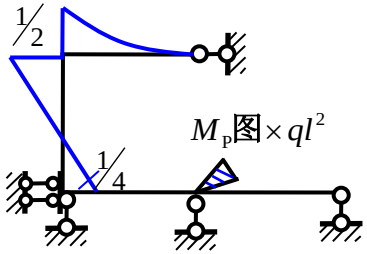
$Z_1=\dfrac{ql^2}{132i}$　$Z_2=\dfrac{-7ql^2}{264i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

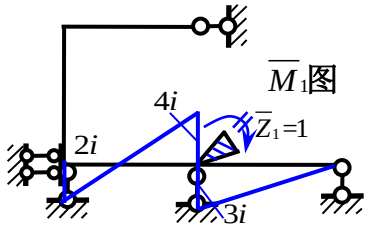


【例题22】用位移法作弯矩图。（刚架4-35）









$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

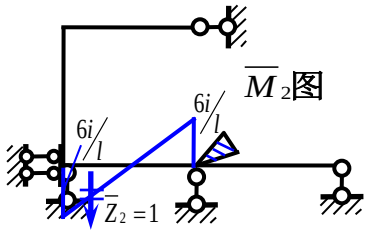
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

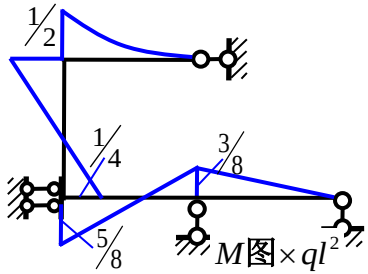
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=12i/l^2$

$k_{21}=k_{12}=6i/l$　$F_{1P}=0$　$F_{2P}=-ql$

$7iZ_1+\dfrac{6i}{l}Z_2=0$

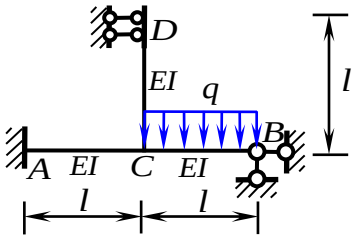
$\dfrac{6i}{l}Z_1+\dfrac{12i}{l^2}Z_2-ql=0$

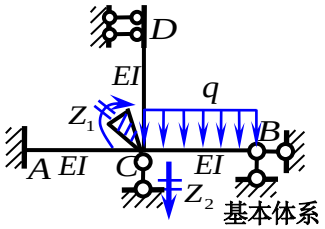


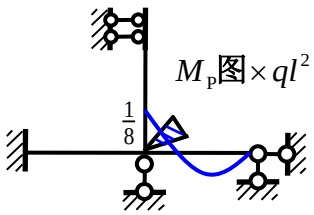


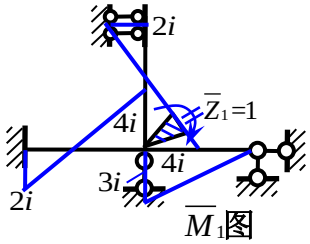
$Z_1=\dfrac{-ql^2}{8i}$　$Z_2=\dfrac{7ql^3}{48i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

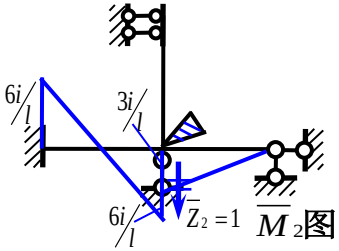
【例题23】用位移法作弯矩图。（刚架4-39）











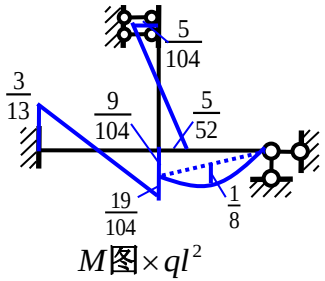
$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$　$k_{11}=11i$　$k_{22}=15i/l^2$　$k_{21}=k_{12}=-3i/l$

$F_{1P}=-ql^2/8$　$F_{2P}=-5ql/8$

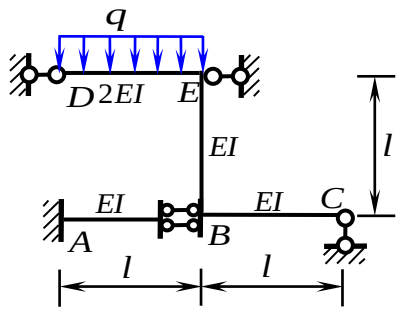
$$11iZ_1-\frac{3i}{l}Z_2-\frac{ql^2}{8}=0$$
$$-\frac{3i}{l}Z_1+\frac{15i}{l^2}Z_2-\frac{5ql}{8}=0$$

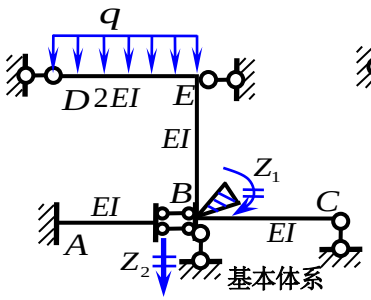
$Z_1=\dfrac{5ql^2}{208i}$　$Z_2=\dfrac{29ql^3}{624i}$

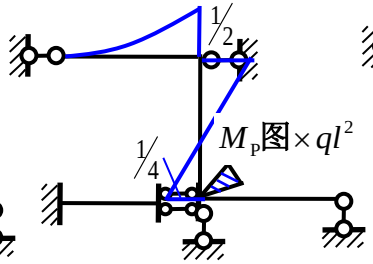


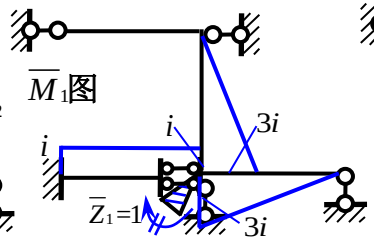
$$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$$

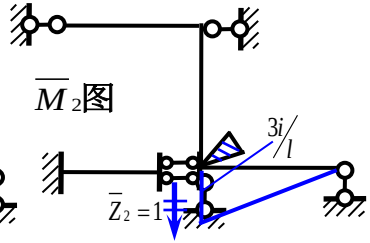
【例题24】用位移法作弯矩图。（刚架4-40）











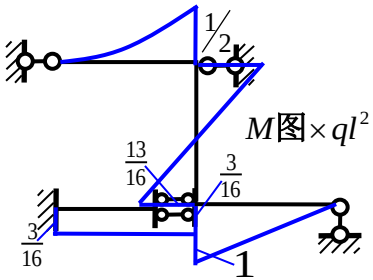
$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=3i/l^2$　$k_{21}=k_{12}=3i/l$

$F_{1P}=-ql^2/4$　$F_{2P}=-ql$

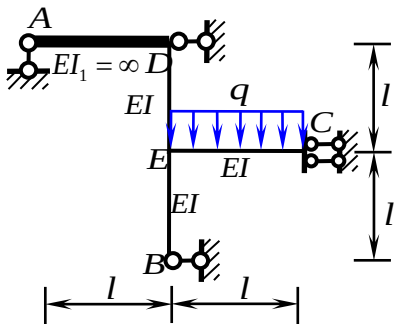
$$7iZ_1+\frac{3i}{l}Z_2-\frac{ql^2}{4}=0$$
$$\frac{3i}{l}Z_1+\frac{3i}{l^2}Z_2-ql=0$$

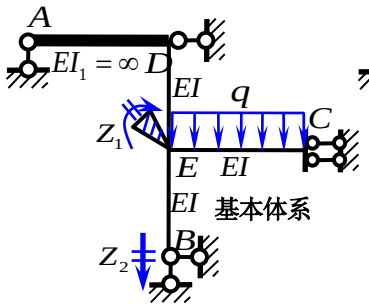
$Z_1=\dfrac{-3ql^2}{16i}$　$Z_2=\dfrac{25ql^3}{48i}$

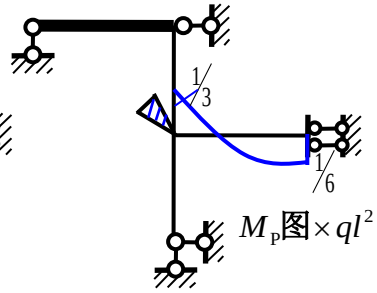


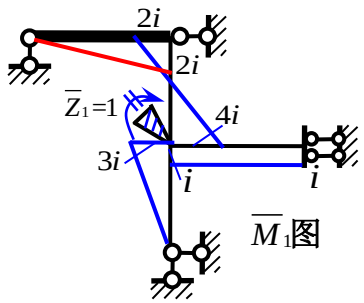
$$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$$

【例题25】用位移法作弯矩图。（刚架5-5）









$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=4i/l^2$

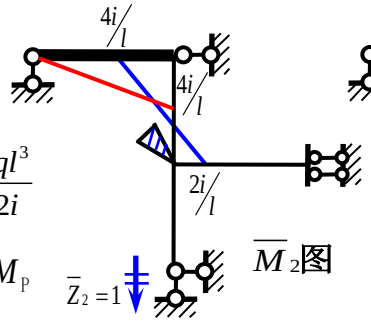
$k_{21}=k_{12}=2i/l$　$F_{1P}=-ql^2/3$　$F_{2P}=-ql$

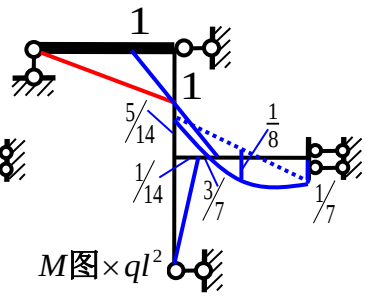
$8iZ_1+2i/l\,Z_2-ql^2/3=0$

$2i/l\,Z_1+4i/l^2\,Z_2-ql=0$

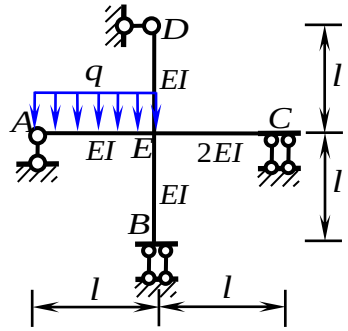
$Z_1=\dfrac{-ql^2}{42i}$　$Z_2=\dfrac{11ql^3}{42i}$

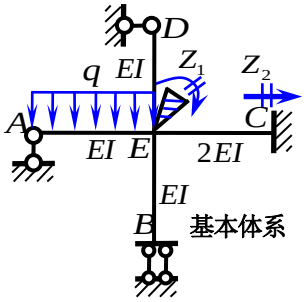
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

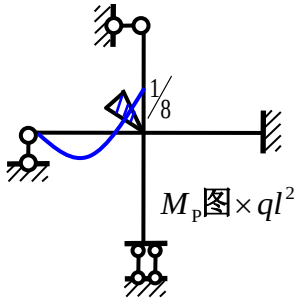


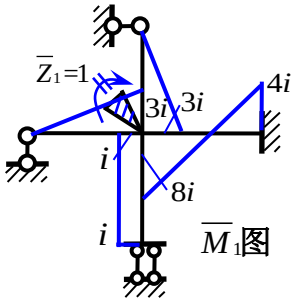


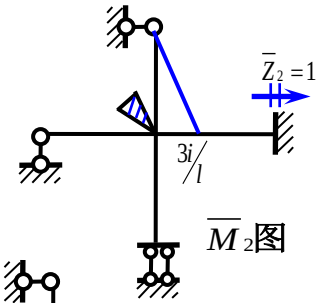
【例题26】用位移法作弯矩图。（刚架5-6）

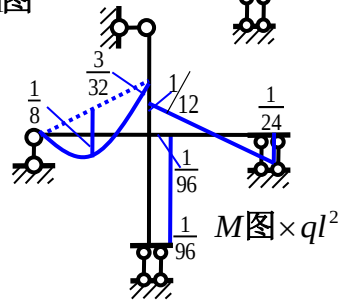












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=15i$　$k_{22}=3i/l^2$　$k_{21}=k_{12}=3i/l$

$F_{1P}=ql^2/8$　$F_{2P}=0$

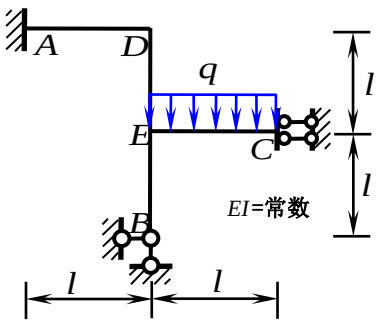
$15iZ_1+3i/l\,Z_2+ql^2/8=0$

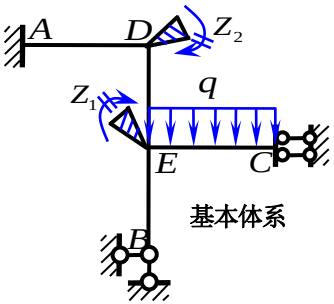
$3i/l\,Z_1+3i/l^2\,Z_2=0$

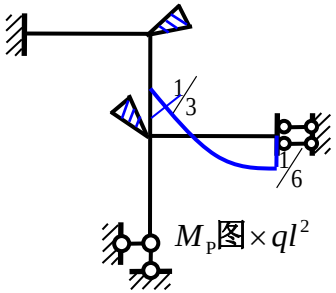
$Z_1=\dfrac{-ql^2}{96i}$　$Z_2=\dfrac{ql^3}{96i}$

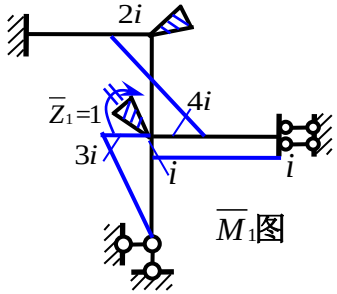
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

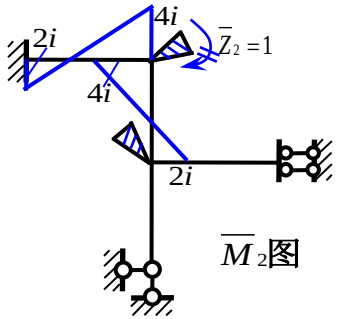
【例题27】用位移法作弯矩图。（刚架5-7）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

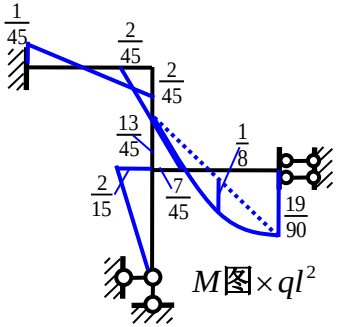
$F_{1P}=-ql^2/3$　$F_{2P}=0$

$8iZ_1+2iZ_2-ql^2/3=0$

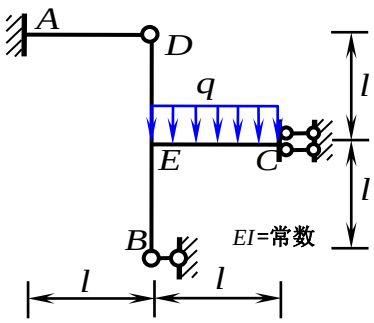
$2iZ_1+8iZ_2=0$

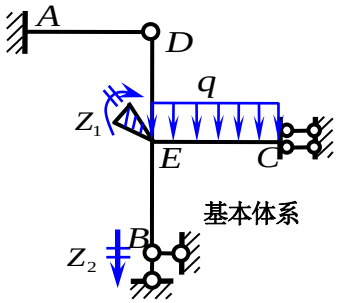
$Z_1=\dfrac{2ql^2}{45i}$　$Z_2=\dfrac{-ql^2}{90i}$

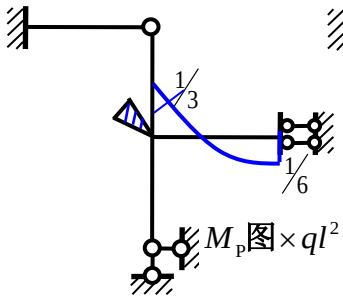
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

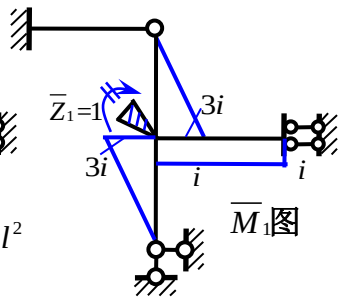


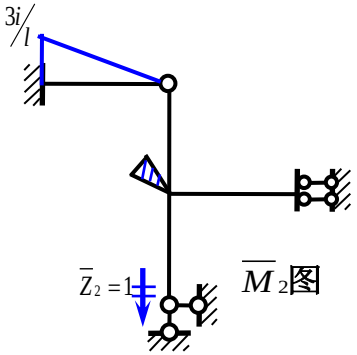
【例题28】用位移法作弯矩图。（刚架5-9）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=3i/l^2$　$k_{21}=k_{12}=0$

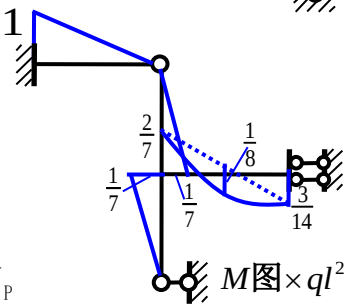
$F_{1P}=-ql^2/3$　$F_{2P}=-ql$

$7iZ_1-ql^2/3=0$

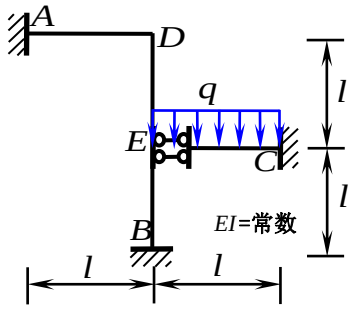
$3i/l^2\,Z_2-ql=0$

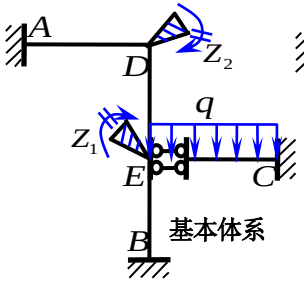
$Z_1=\dfrac{ql^2}{21i}$　$Z_2=\dfrac{ql^3}{3i}$

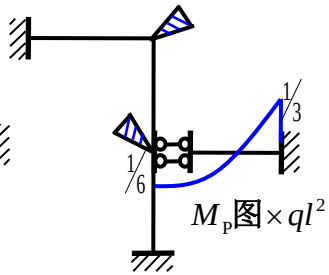
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

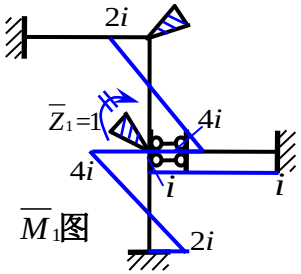


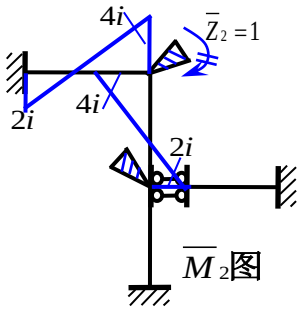
【例题29】用位移法作弯矩图。（刚架5-20）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

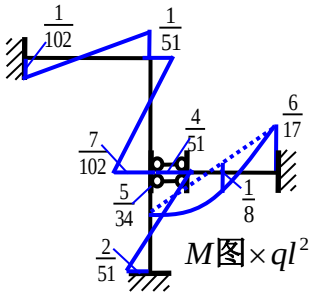
令线刚度：$i=EI/l$　$k_{11}=9i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

$F_{1P}=ql^2/6$　$F_{2P}=0$　$9iZ_1+2iZ_2+ql^2/6=0$

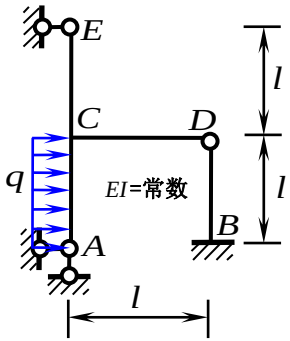
$2iZ_1+8iZ_2=0$

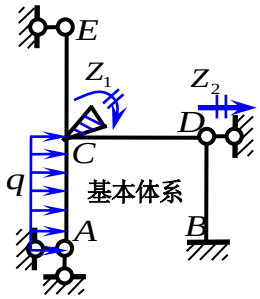
$Z_1=\dfrac{-ql^2}{51i}$　$Z_2=\dfrac{ql^2}{204i}$

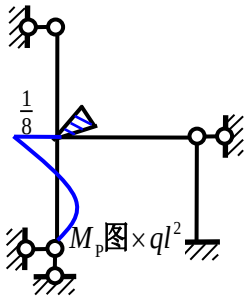
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

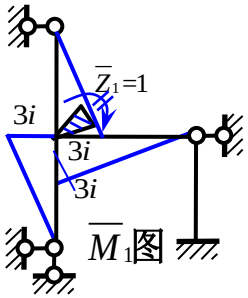


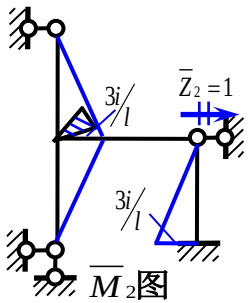
【例题30】用位移法作弯矩图。（刚架5-21）

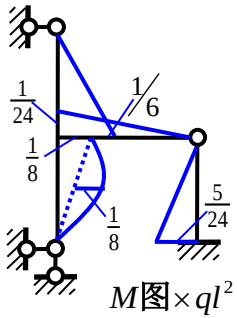












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=9i$　$k_{22}=9i/l^2$　$k_{21}=k_{12}=0$

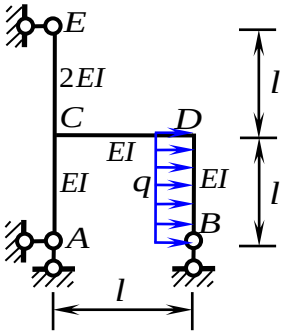
$F_{1P}=ql^2/8$　$F_{2P}=-5ql/8$　$9iZ_1+ql^2/8=0$

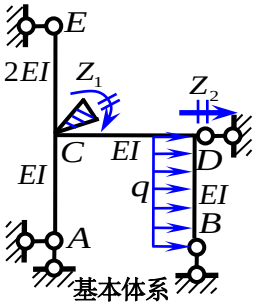
$9i/l^2\,Z_2-5ql/8=0$

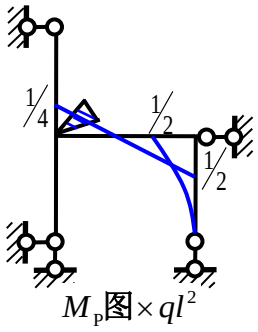
$Z_1=\dfrac{-ql^2}{72i}$　$Z_2=\dfrac{5ql^3}{72i}$

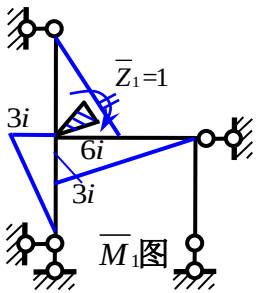
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

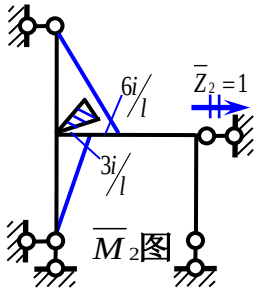
【例题31】用位移法作弯矩图。（刚架5-22）

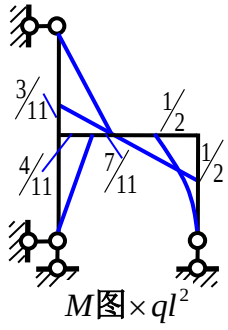












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

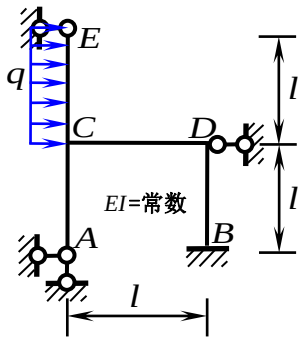
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

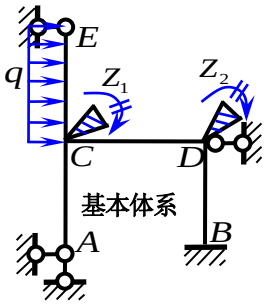
令线刚度：$i=EI/l$　$k_{11}=12i$　$k_{22}=9i/l^2$　$k_{21}=k_{12}=3i/l$

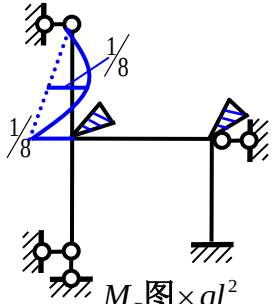
$F_{1P}=-ql^2/4$　$F_{2P}=-ql$　$12iZ_1+3i/l\,Z_2-ql^2/4=0$　$3i/l\,Z_1+9i/l^2\,Z_2-ql=0$

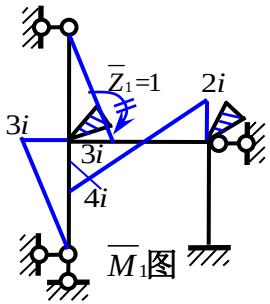
$Z_1=\dfrac{-ql^2}{132i}$　$Z_2=\dfrac{5ql^3}{44i}$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

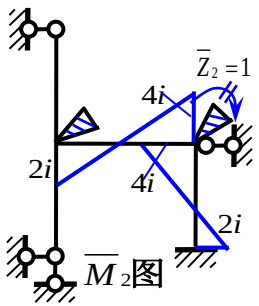
【例题32】用位移法作弯矩图。（刚架5-23）

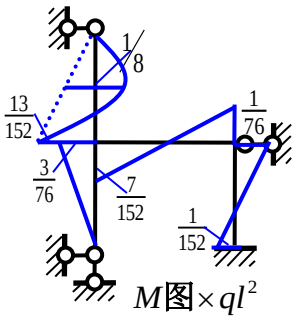












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

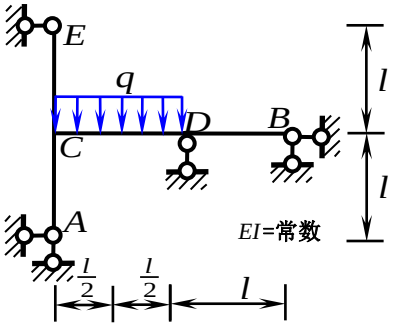
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

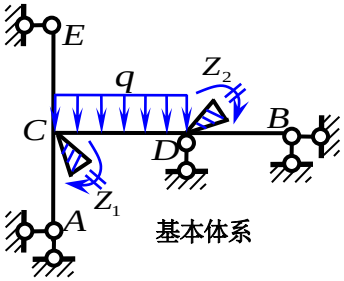
令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

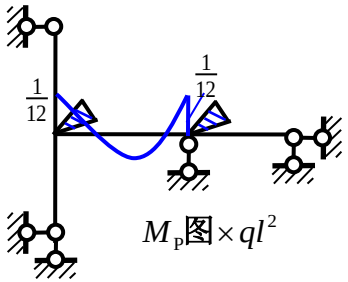
$F_{1P}=-ql^2/8$　$F_{2P}=0$　$10iZ_1+2iZ_2-ql^2/8=0$　$2iZ_1+8iZ_2=0$

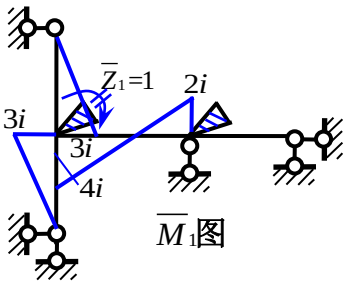
$Z_1=\dfrac{ql^2}{76i}$　$Z_2=\dfrac{-ql^2}{304i}$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

【例题33】用位移法作弯矩图。（刚架5-25）







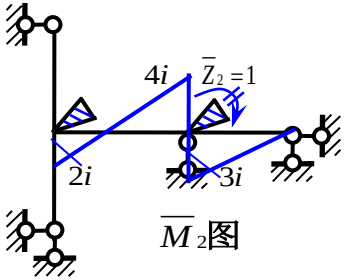


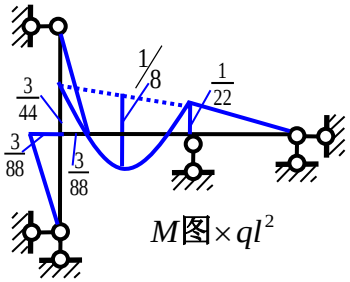
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=7i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$

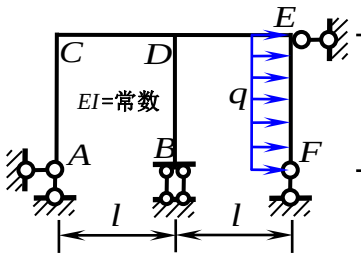
$F_{1P}=-ql^2/12$　$F_{2P}=ql^2/12$　$10iZ_1+2iZ_2-ql^2/12=0$　$Z_1=\dfrac{ql^2}{88i}$　$Z_2=\dfrac{-ql^2}{66i}$

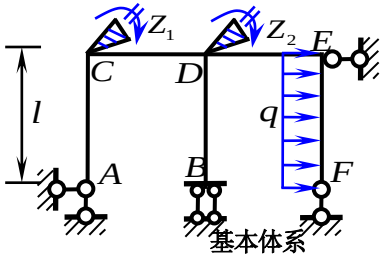
$2iZ_1+7iZ_2+ql^2/12=0$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

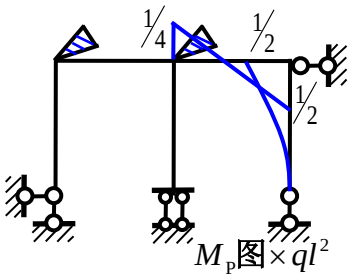


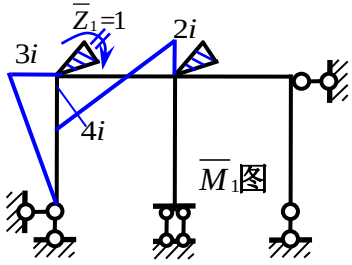


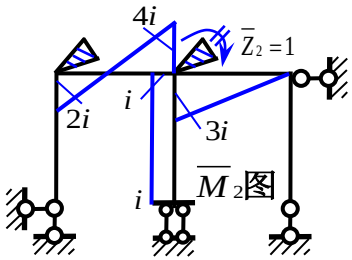
【例题34】用位移法作弯矩图。（刚架5-27）











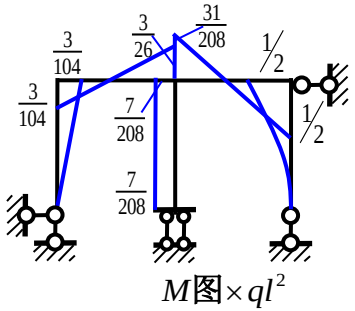
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

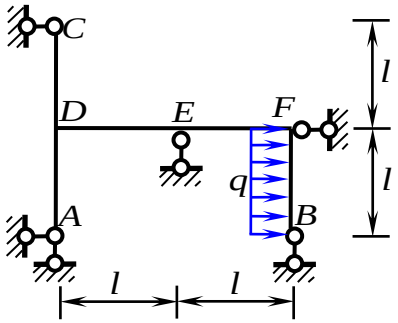
$F_{1P}=0$　$F_{2P}=-ql^2/4$　$7iZ_1+2iZ_2=0$

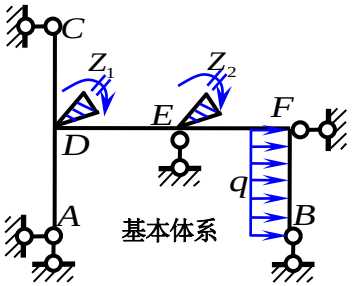
$2iZ_1+8iZ_2-ql^2/4=0$　$Z_1=\dfrac{-ql^2}{104i}$　$Z_2=\dfrac{7ql^2}{208i}$

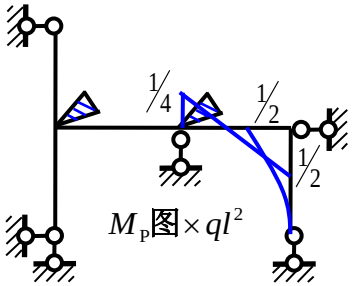
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

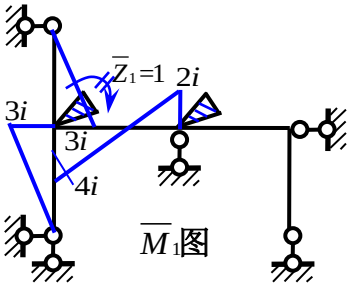


【例题35】用位移法作弯矩图。（刚架5-29）









$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=7i$

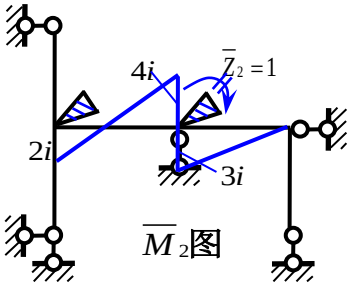
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{21}=k_{12}=2i$

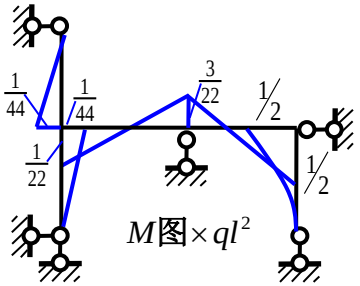
$F_{1P}=0$　$F_{2P}=-ql^2/4$　$10iZ_1+2iZ_2=0$

$2iZ_1+7iZ_2-ql^2/4=0$

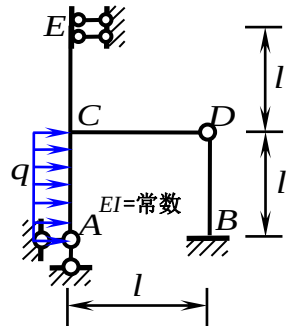
$Z_1=\dfrac{-ql^2}{132i}$　$Z_2=\dfrac{5ql^2}{132i}$

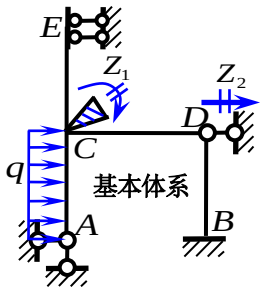
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

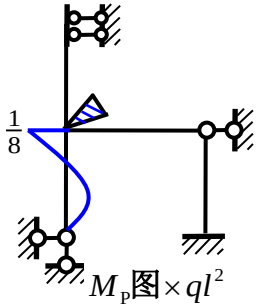


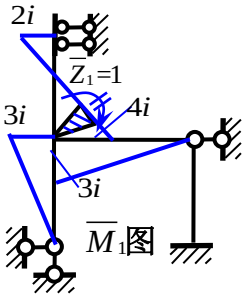


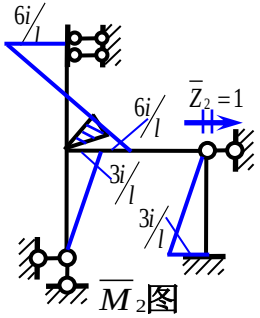
【例题36】用位移法作弯矩图。（刚架5-33）

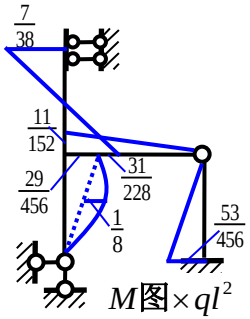












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=18i/l^2$　$k_{21}=k_{12}=3i/l$

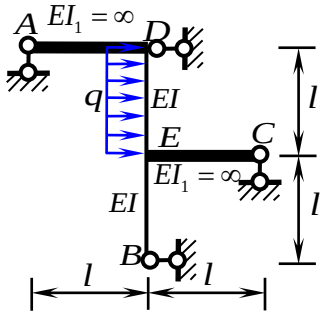
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

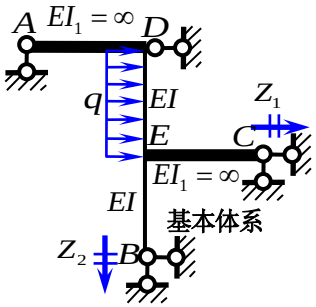
$F_{1P}=ql^2/8$　$F_{2P}=-5ql/8$　$10iZ_1+3i/l\,Z_2+ql^2/8=0$

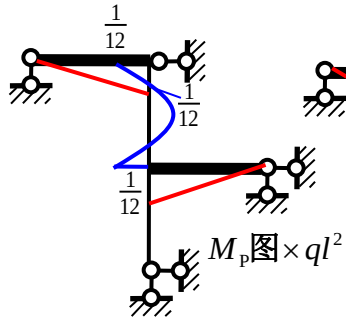
$3i/l\,Z_1+18i/l^2\,Z_2-5ql/8=0$

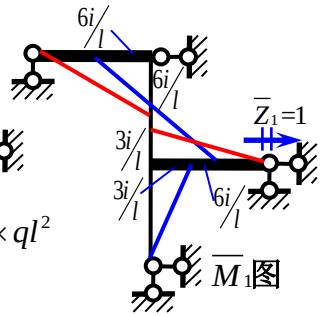
$Z_1=\dfrac{-11ql^2}{456i}$　$Z_2=\dfrac{53ql^3}{1368i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

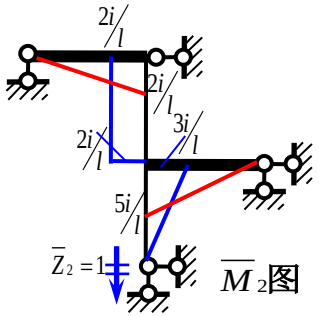
【例题37】用位移法作弯矩图。（刚架5-30）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=15i/l^2$　$k_{22}=7i/l^2$　$k_{21}=k_{12}=3i/l$

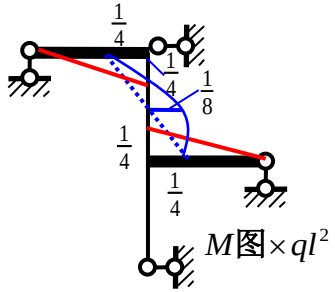
$F_{1P}=-ql/2$　$F_{2P}=ql/6$

$15i/l^2\,Z_1+3i/l^2\,Z_2-ql/2=0$

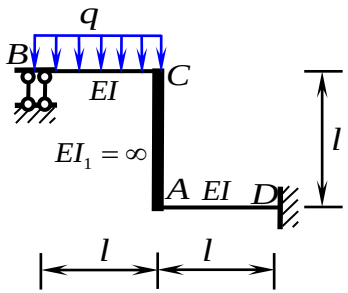
$3i/l^2\,Z_1+7i/l^2\,Z_2+ql/6=0$

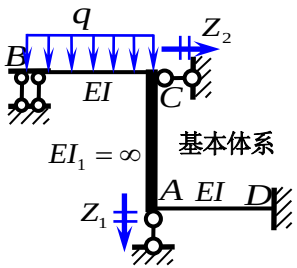
$Z_1=\dfrac{ql^3}{24i}$　$Z_2=\dfrac{-ql^3}{24i}$

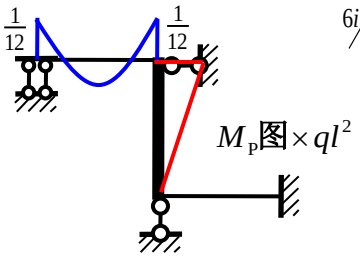
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

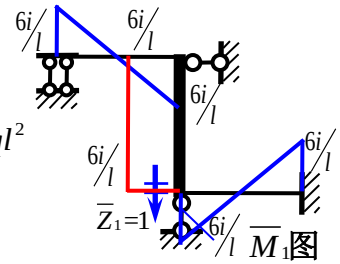


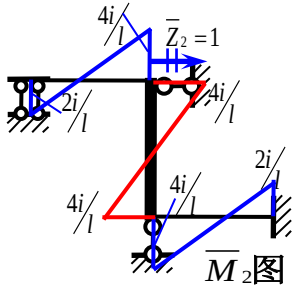
【例题38】用位移法作弯矩图。（刚架5-31）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=24i/l^2$　$k_{22}=8i/l^2$　$k_{21}=k_{12}=0$

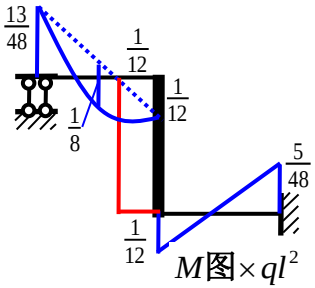
$F_{1P}=-ql/2$　$F_{2P}=ql/12$

$24i/l^2\,Z_1-ql/2=0$

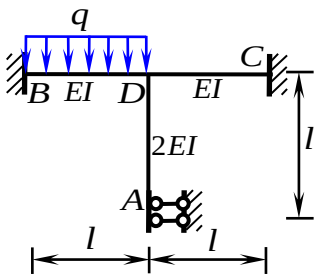
$8i/l^2\,Z_2+ql/12=0$

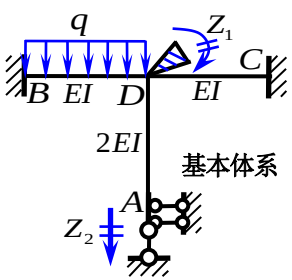
$Z_1=\dfrac{ql^3}{48i}$　$Z_2=\dfrac{-ql^3}{96i}$

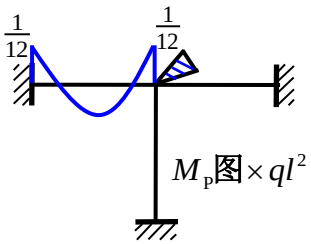
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

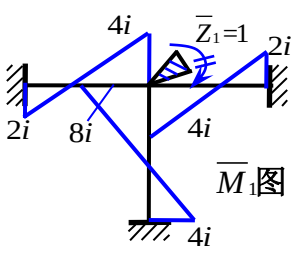


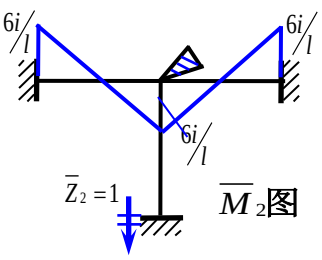
【例题39】用位移法作弯矩图。（刚架5-36）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=16i$　$k_{22}=24i/l^2$　$k_{21}=k_{12}=0$

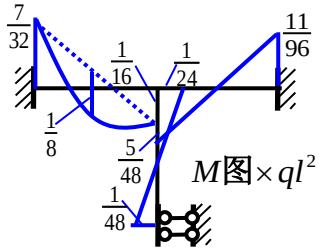
$F_{1P}=ql^2/12$　$F_{2P}=-ql/2$

$16iZ_1+ql^2/12=0$

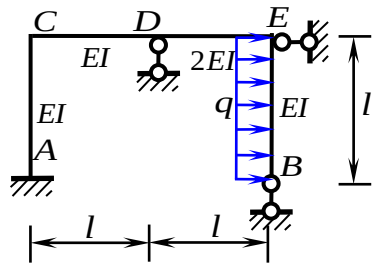
$24i/l^2\,Z_2-ql/2=0$

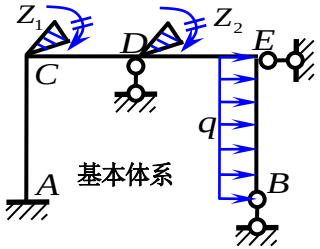
$Z_1=\dfrac{-ql^2}{192i}$　$Z_2=\dfrac{ql^3}{48i}$

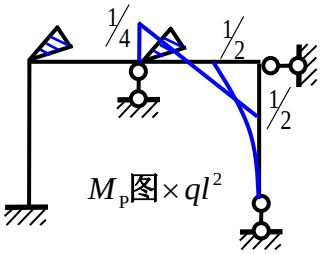
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

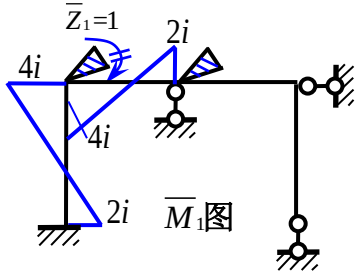


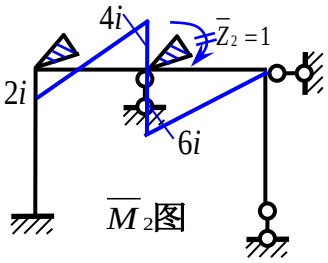
【例题40】用位移法作弯矩图。（刚架5-40）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=10i$　$k_{21}=k_{12}=2i$

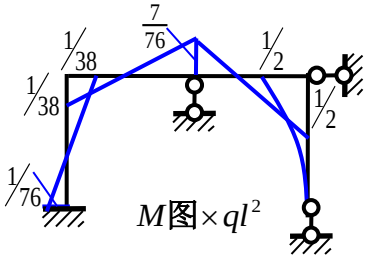
$F_{1P}=0$　$F_{2P}=-ql^2/4$

$8iZ_1+2iZ_2=0$

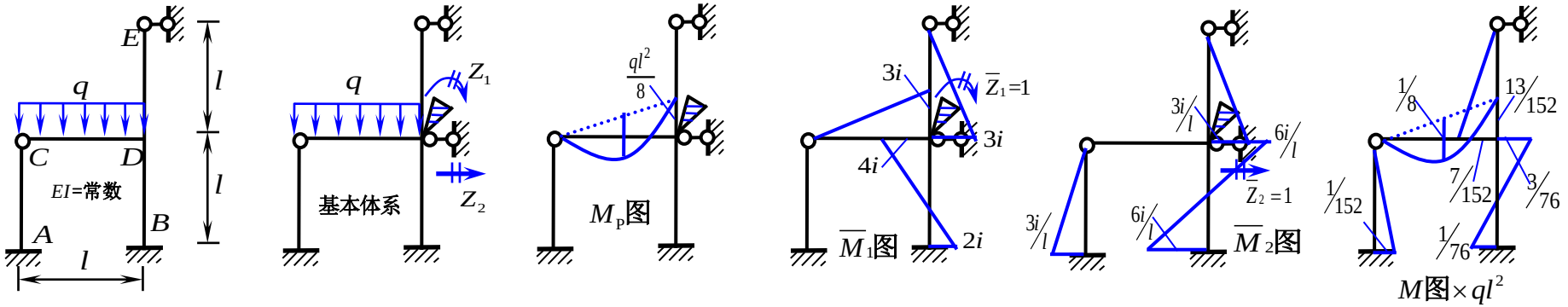
$2iZ_1+10iZ_2-ql^2/4=0$

$Z_1=\dfrac{-ql^2}{152i}$　$Z_2=\dfrac{ql^2}{38i}$

$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$



【例题41】用位移法作弯矩图。（刚架6-1）

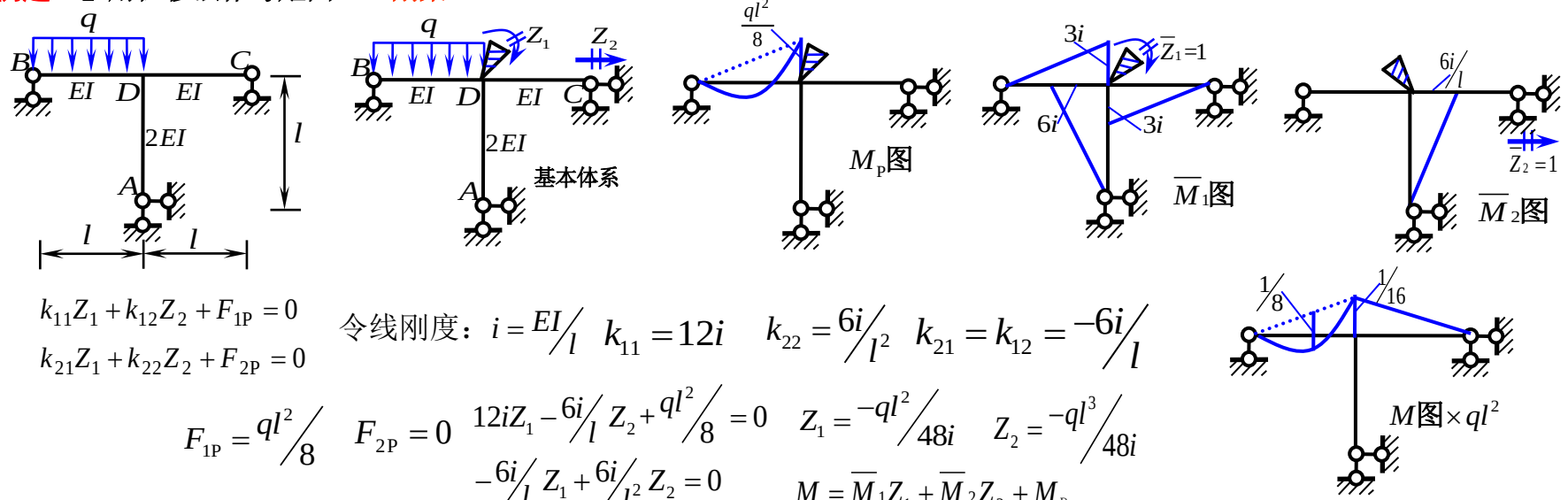


$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=18i/l^2$　$k_{21}=k_{12}=-3i/l$

$F_{1P}=ql^2/8$　$F_{2P}=0$　$10iZ_1-\frac{3i}{l}Z_2+ql^2/8=0$　$-\frac{3i}{l}Z_1+\frac{18i}{l^2}Z_2=0$　$Z_1=-ql^2/76i$　$Z_2=-ql^3/456i$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

【例题42】用位移法作弯矩图。（刚架6-4）

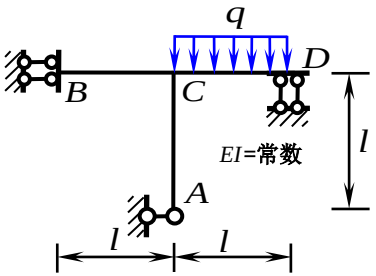


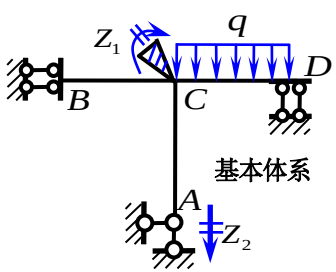
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

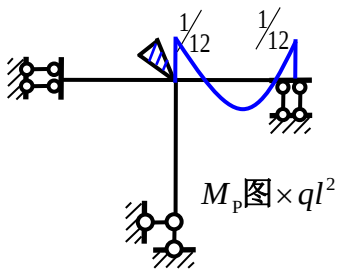
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　令线刚度：$i=EI/l$　$k_{11}=12i$　$k_{22}=6i/l^2$　$k_{21}=k_{12}=-6i/l$

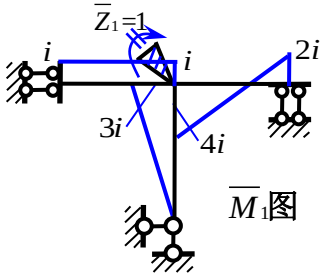
$F_{1P}=ql^2/8$　$F_{2P}=0$　$12iZ_1-\frac{6i}{l}Z_2+ql^2/8=0$　$-\frac{6i}{l}Z_1+\frac{6i}{l^2}Z_2=0$　$Z_1=-ql^2/48i$　$Z_2=-ql^3/48i$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

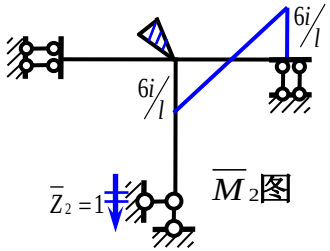
【例题43】用位移法作弯矩图。（刚架6-12）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=6i/l$

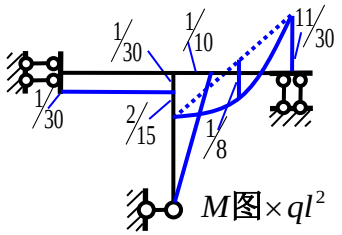
$F_{1P}=-ql^2/12$　$F_{2P}=-ql/2$

$8iZ_1+6i/l\,Z_2-ql^2/12=0$

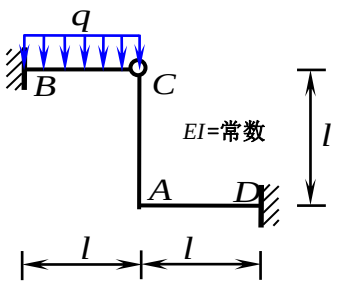
$6i/l\,Z_1+12i/l^2\,Z_2-ql/2=0$

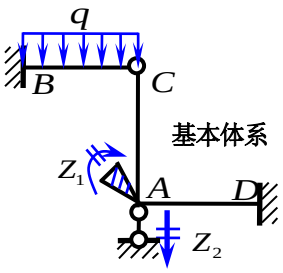
$Z_1=-ql^2/30i$　$Z_2=7ql^3/120i$

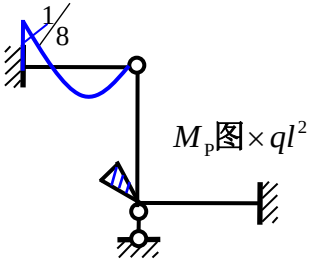
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

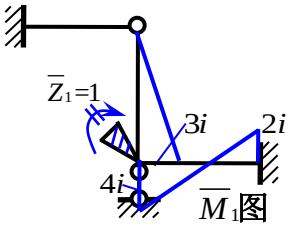


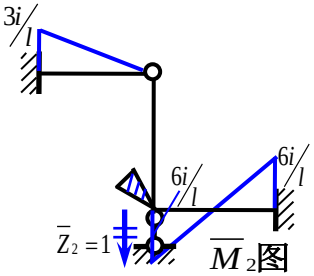
【例题44】用位移法作弯矩图。（刚架6-2）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=15i/l^2$　$k_{21}=k_{12}=6i/l$

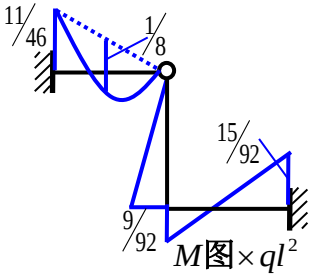
$F_{1P}=0$　$F_{2P}=-3ql/8$

$7iZ_1+6i/l\,Z_2=0$

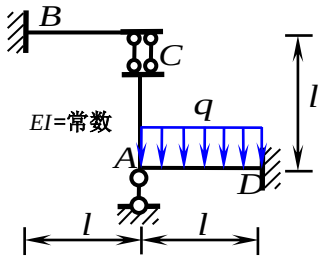
$6i/l\,Z_1+15i/l^2\,Z_2-3ql/8=0$

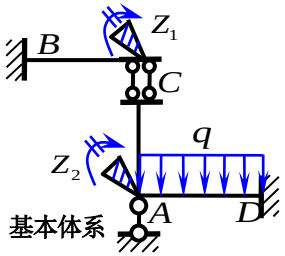
$Z_1=-3ql^2/92i$　$Z_2=7ql^3/184i$

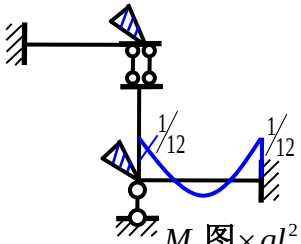
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

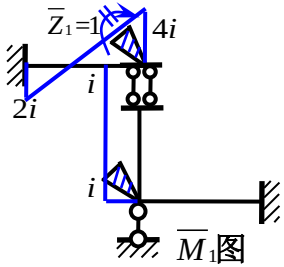


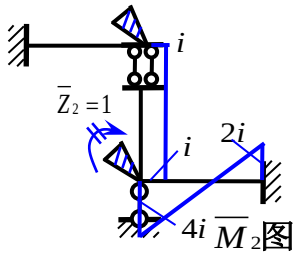
【例题45】用位移法作弯矩图。（刚架6-18）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

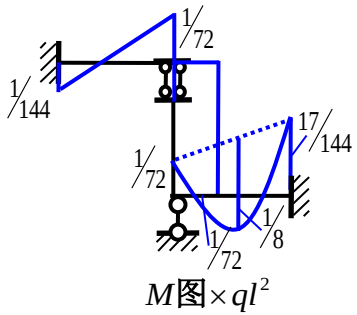
令线刚度：$i=EI/l$　$k_{11}=5i$　$k_{22}=5i$　$k_{21}=k_{12}=-i$

$$F_{1P}=0 \quad F_{2P}=-ql^2/12$$

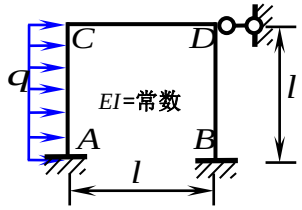
$$5iZ_1-iZ_2=0$$
$$-iZ_1+5iZ_2-ql^2/12=0$$

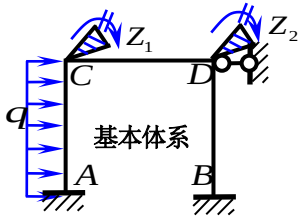
$$Z_1=ql^2/288i \quad Z_2=5ql^2/288i$$

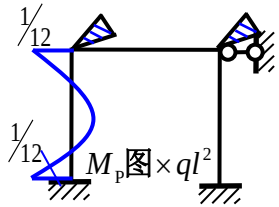
$$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

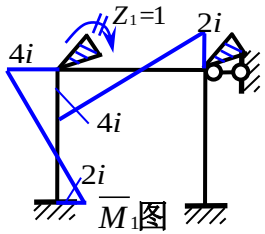


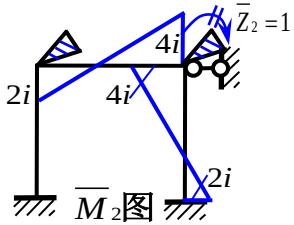
【例题46】用位移法作弯矩图。（刚架6-19）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

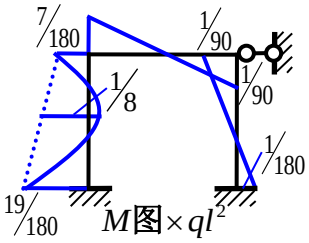
令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

$$F_{1P}=ql^2/12 \quad F_{2P}=0$$

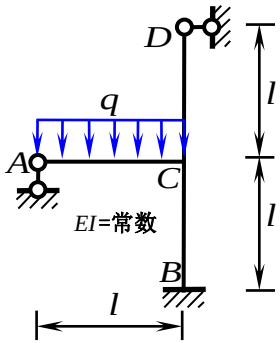
$$8iZ_1+2Z_2+ql^2/12=0$$
$$2iZ_1+8iZ_2=0$$

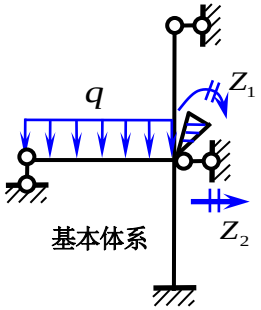
$$Z_1=-ql^2/90i \quad Z_2=ql^2/360i$$

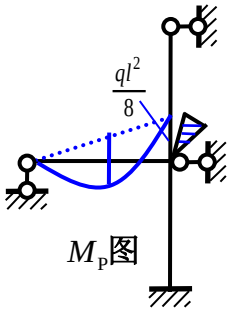
$$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

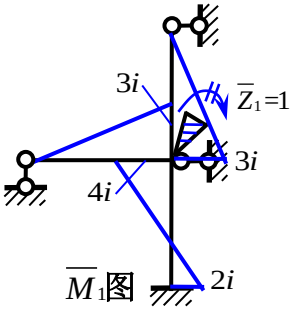


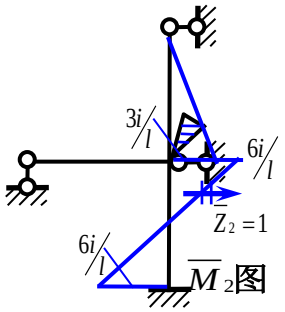
【例题47】用位移法作弯矩图。（刚架6-24）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=15i/l^2$　$k_{21}=k_{12}=-3i/l$

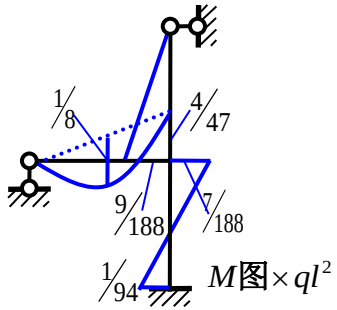
$F_{1P}=ql^2/8$　$F_{2P}=0$

$10iZ_1-\frac{3i}{l}Z_2+ql^2/8=0$

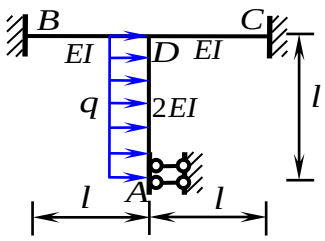
$-\frac{3i}{l}Z_1+\frac{15i}{l^2}Z_2=0$

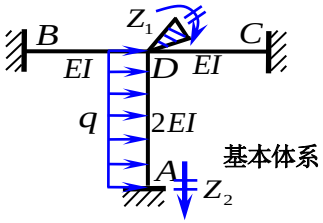
$Z_1=-5ql^2/376i$　$Z_2=-ql^3/376i$

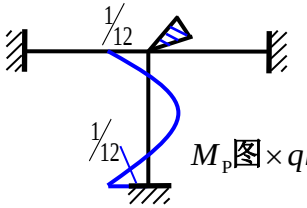
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

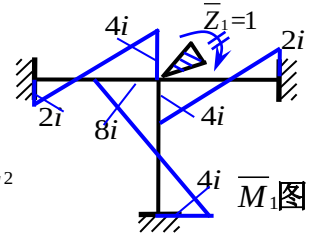


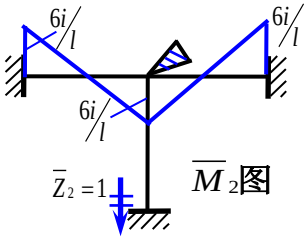
【例题48】用位移法作弯矩图。（刚架6-26）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=16i$　$k_{22}=24i/l^2$　$k_{21}=k_{12}=0$

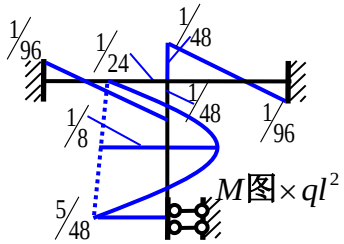
$F_{1P}=ql^2/12$　$F_{2P}=0$

$16iZ_1+ql^2/12=0$

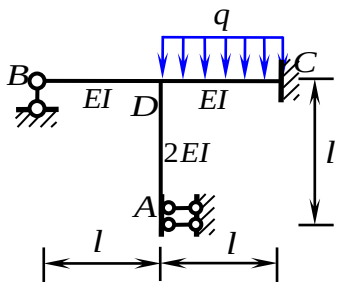
$24i/l^2\,Z_2=0$

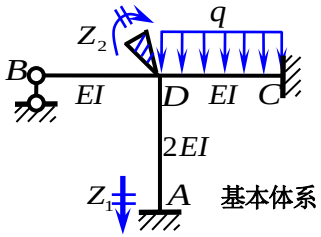
$Z_1=-ql^2/192i$　$Z_2=0$

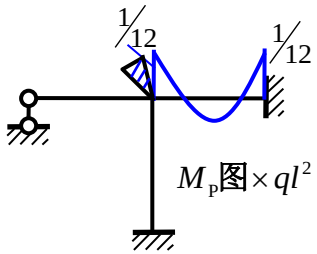
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

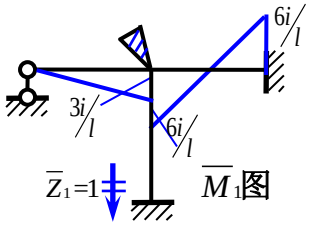


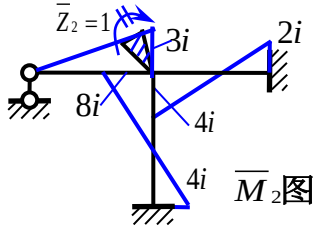
【例题49】用位移法作弯矩图。（刚架6-39）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

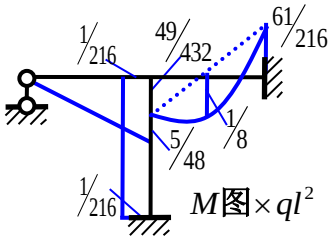
令线刚度：$i=EI/l$　$k_{11}=15i/l^2$　$k_{22}=15i$　$k_{21}=k_{12}=3i/l$

$F_{1P}=-ql/2$　$F_{2P}=-ql^2/12$

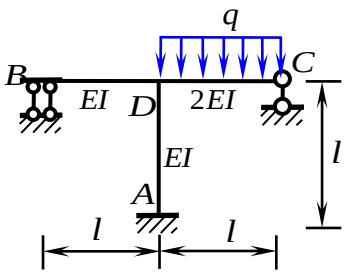
$15i/l^2\,Z_1+3i/l\,Z_2-ql/2=0$　$Z_1=29ql^3/864i$　$Z_2=-ql^2/864i$

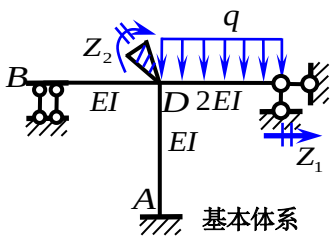
$3i/l\,Z_1+15iZ_2-ql^2/12=0$

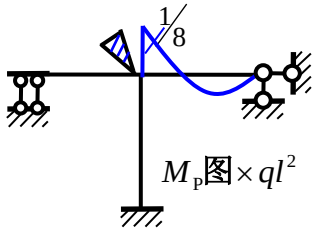
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

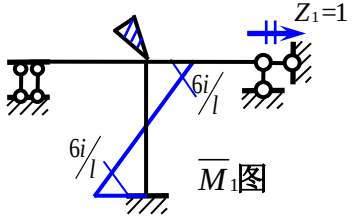


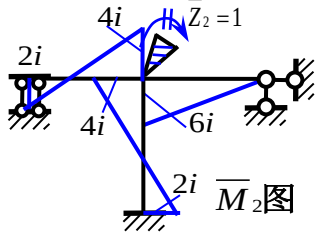
【例题50】用位移法作弯矩图。（刚架6-40）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

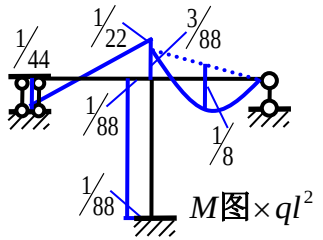
令线刚度：$i=EI/l$　$k_{11}=12i/l^2$　$k_{22}=14i$　$k_{21}=k_{12}=-6i/l$

$F_{1P}=0$　$F_{2P}=-ql^2/8$

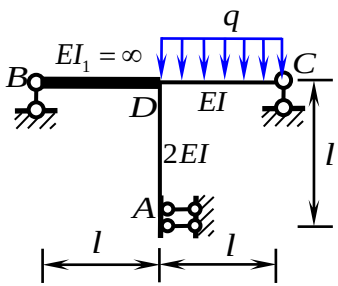
$12i/l^2\,Z_1-6i/l\,Z_2=0$　$Z_1=ql^3/176i$　$Z_2=ql^2/88i$

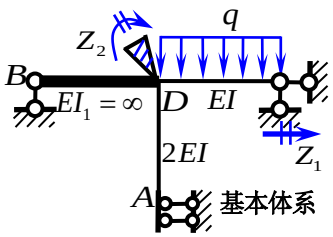
$-6i/l\,Z_1+14iZ_2-ql^2/8=0$

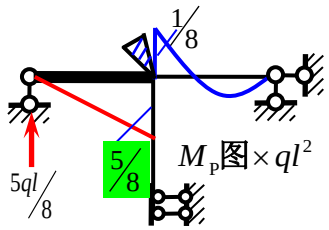
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

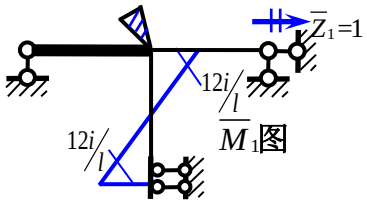


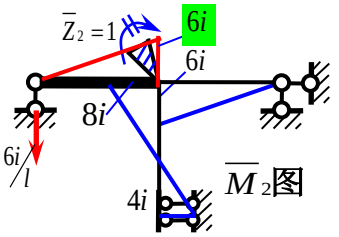
【例题51】用位移法作弯矩图。（刚架6-36）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=24i/l^2$　$k_{22}=20i$　$k_{21}=k_{12}=-12i/l$　$F_{1P}=0$

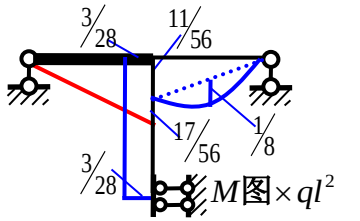
$F_{2P}=-3ql^2/4$

$24i/l^2\,Z_1-12i/l\,Z_2=0$

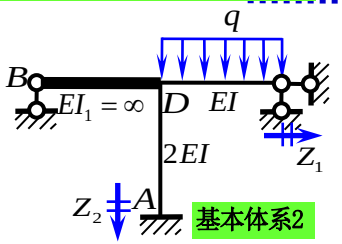
$-12i/l\,Z_1+20iZ_2-3ql^2/4=0$

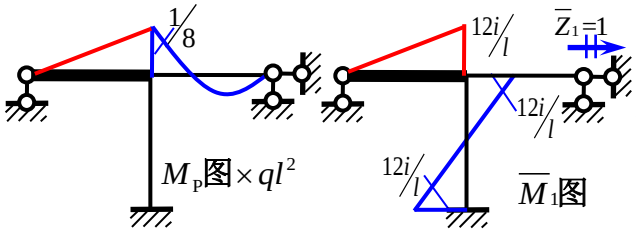
$Z_1=3ql^3/112i$　$Z_2=3ql^2/56i$

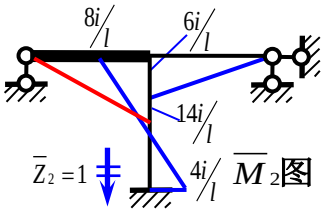
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$



第2种基本体系







$k_{11}=24i/l^2$　$k_{22}=20i/l^2$　$k_{21}=k_{12}=-12i/l$　$F_{1P}=0$　$F_{2P}=-3ql/4$

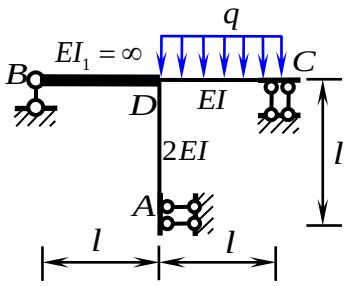
$24i/l^2\,Z_1-12i/l^2\,Z_2=0$

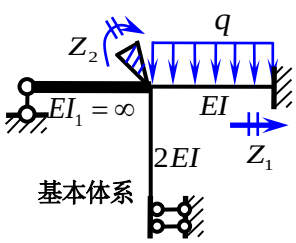
$-12i/l^2\,Z_1+20i/l^2\,Z_2-3ql/4=0$

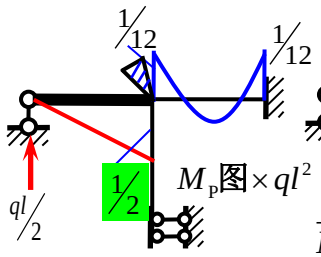
$Z_1=3ql^3/112i$　$Z_2=3ql^3/56i$

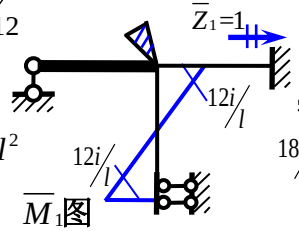
注：无穷刚杆弯矩图由力矩平衡条件得到

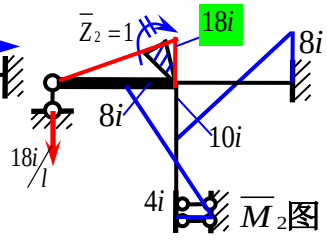
【例题52】用位移法作弯矩图。（刚架6-38）

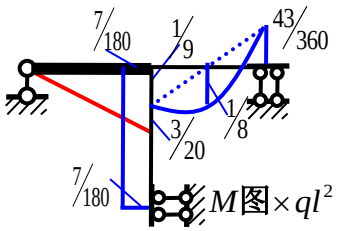












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

令线刚度：$i=EI/l$　$k_{11}=24i/l^2$　$k_{22}=36i$　$24i/l^2\,Z_1-12i/l\,Z_2=0$

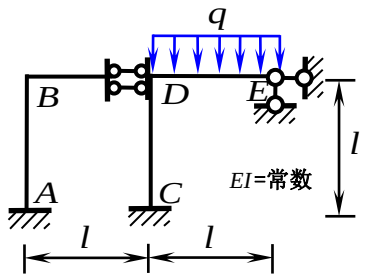
$k_{21}=k_{12}=-12i/l$　$F_{1P}=0$　$F_{2P}=-7ql^2/12$

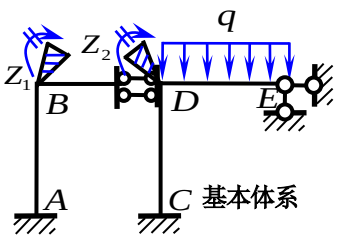
$-12i/l\,Z_1+36iZ_2-7ql^2/12=0$

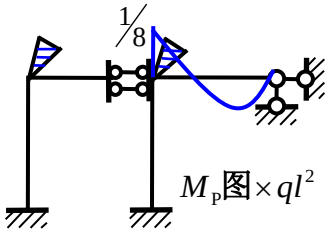
$Z_2=7ql^2/360i$　$Z_1=7ql^3/720i$

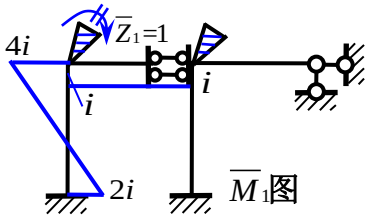
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

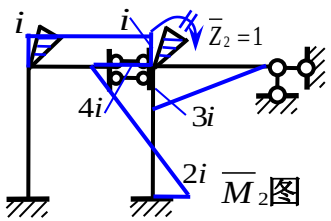
【例题53】用位移法作弯矩图。（刚架7-1）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$k_{22}=8i$　$k_{21}=k_{12}=-i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

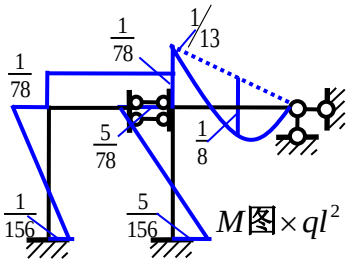
$F_{1P}=0$　$F_{2P}=-ql^2/8$

$5iZ_1-iZ_2=0$

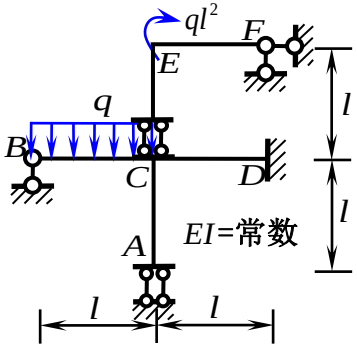
$-iZ_1+8iZ_2-ql^2/8=0$

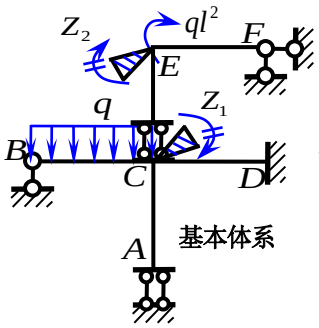
$Z_1=ql^2/312i$　$Z_2=5ql^2/312i$

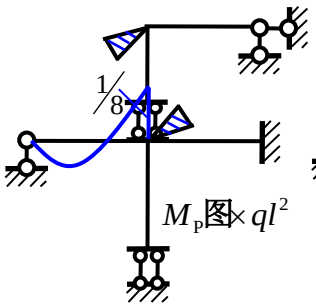
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

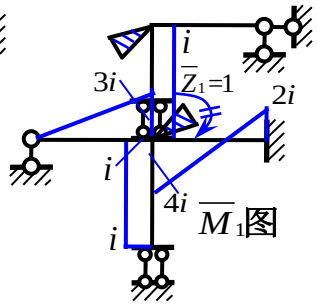


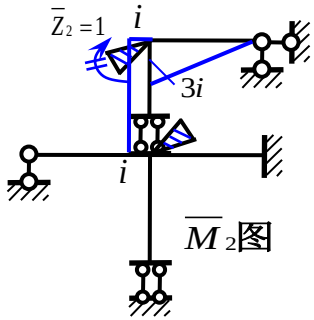
【例题54】用位移法作弯矩图。（刚架7-6）











$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=9i$　$k_{22}=4i$　$k_{21}=k_{12}=-i$

$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

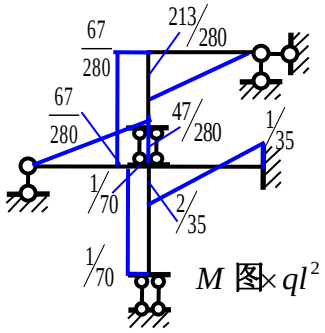
$F_{1P}=ql^2/8$　$F_{2P}=-ql^2$

$9iZ_1-iZ_2+ql^2/8=0$

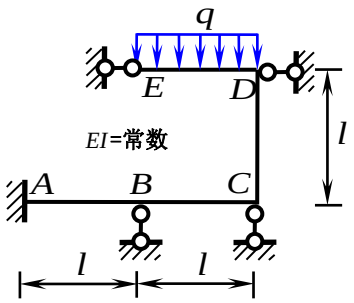
$-iZ_1+4iZ_2-ql^2=0$

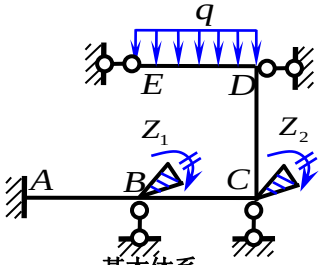
$Z_1=ql^2/70i$　$Z_2=71ql^2/280i$

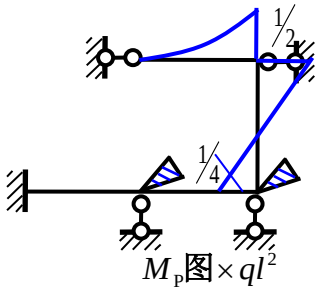
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

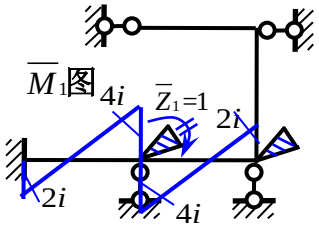


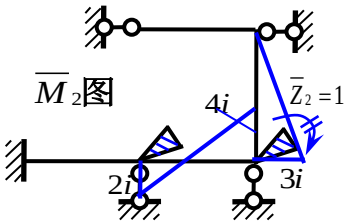
【例题55】用位移法作弯矩图。（刚架7-11）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

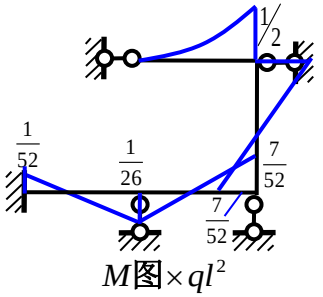
令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=7i$　$k_{21}=k_{12}=2i$

$F_{1P}=0$　$F_{2P}=-ql^2/4$

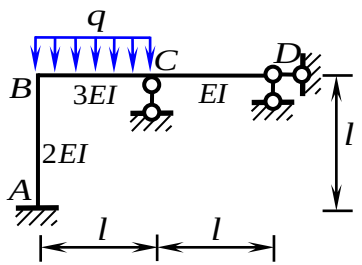
$$8iZ_1+2iZ_2=0$$
$$2iZ_1+7iZ_2-ql^2/4=0$$

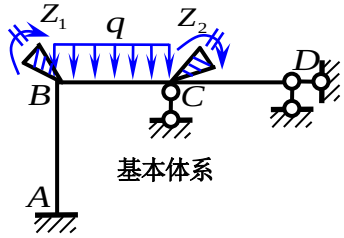
$Z_1=-ql^2/104i$　$Z_2=ql^2/26i$

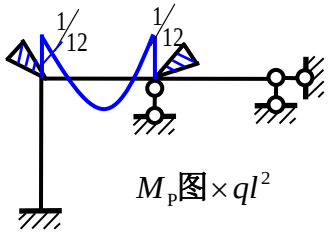
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

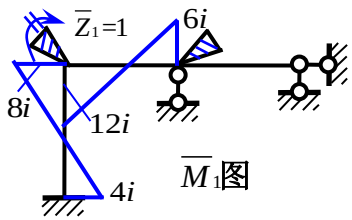


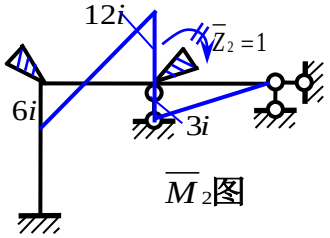
【例题56】用位移法作弯矩图。（刚架7-12）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

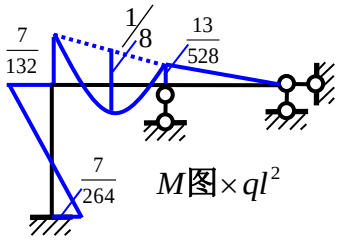
令线刚度：$i=EI/l$　$k_{11}=20i$　$k_{22}=15i$　$k_{21}=k_{12}=6i$

$F_{1P}=-ql^2/12$　$F_{2P}=ql^2/12$

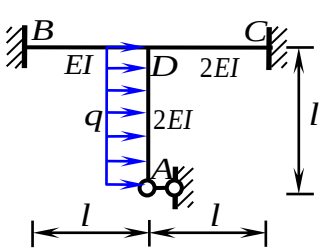
$$20iZ_1+6iZ_2-ql^2/12=0$$
$$6iZ_1+15iZ_2+ql^2/12=0$$

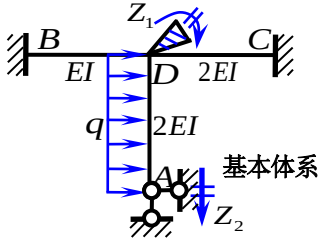
$Z_1=\dfrac{7ql^2}{1056i}$　$Z_2=\dfrac{-13ql^2}{1584i}$

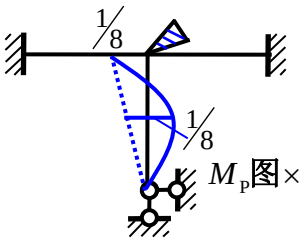
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

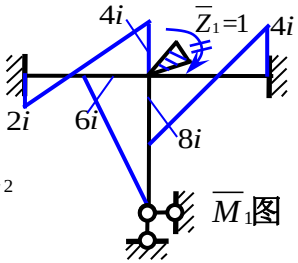


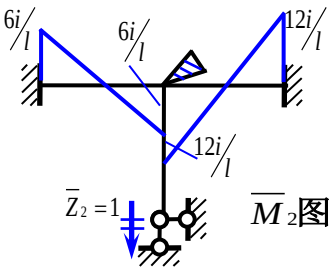
【例题57】用位移法作弯矩图。（刚架7-13）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

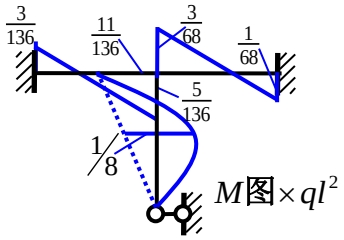
令线刚度：$i=EI/l$　$k_{11}=18i$　$k_{22}=36i/l^2$　$k_{21}=k_{12}=6i/l$

$$F_{1P}=ql^2/8 \qquad F_{2P}=0$$

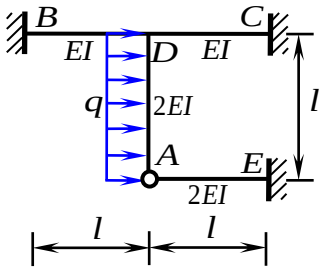
$$18iZ_1+6i/l\,Z_2+ql^2/8=0$$
$$6i/l\,Z_1+36i/l^2\,Z_2=0$$

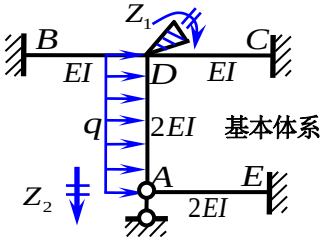
$$Z_1=\frac{-ql^2}{136i} \qquad Z_2=\frac{ql^3}{816i}$$

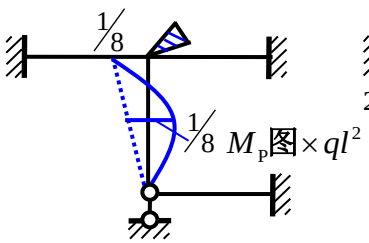
$$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

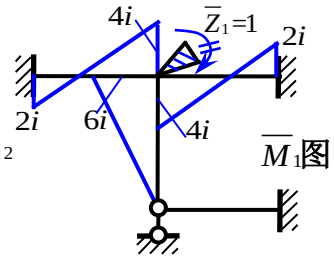


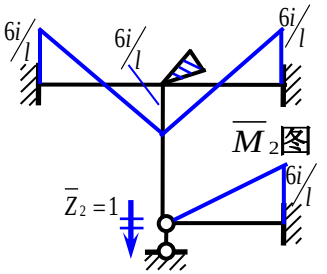
【例题58】用位移法作弯矩图。（刚架7-14）











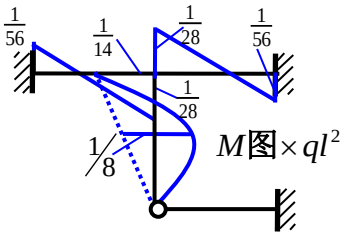
$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$　$k_{11}=14i$　$k_{22}=30i/l^2$　$k_{21}=k_{12}=0$

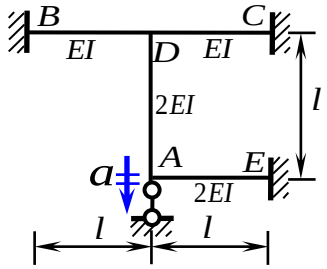
$$F_{1P}=ql^2/8 \qquad F_{2P}=0$$

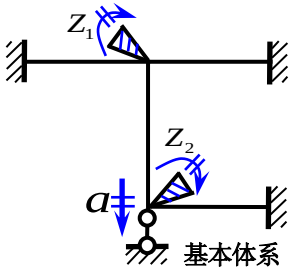
$$14iZ_1+ql^2/8=0$$
$$30i/l^2\,Z_2=0$$

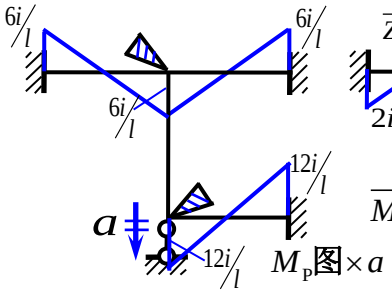
$$Z_1=\frac{-ql^2}{112i} \qquad Z_2=0 \qquad M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

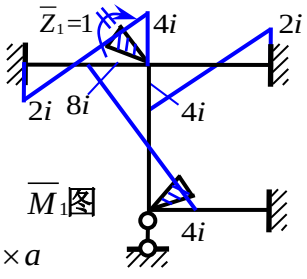


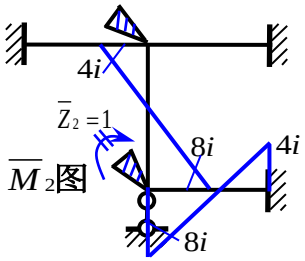
【例题59】用位移法作弯矩图。（刚架7-16）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

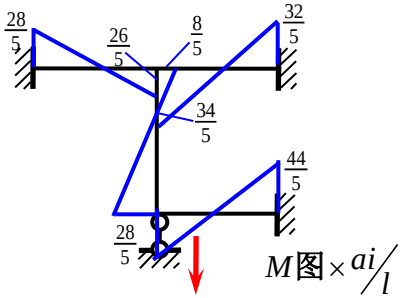
令线刚度：$i=EI/l$　$k_{11}=16i$　$k_{22}=16i$　$k_{12}=k_{21}=4i$

$F_{1P}=0$　$F_{2P}=12ai/l$　$16iZ_1+4iZ_2=0$

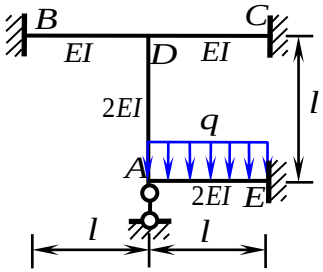
$4iZ_1+16iZ_2+12ai/l=0$

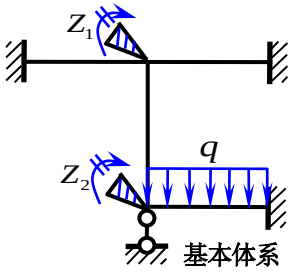
$Z_1=\dfrac{a}{5l}$　$Z_2=\dfrac{-4a}{5l}$

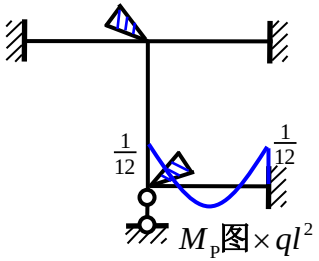
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

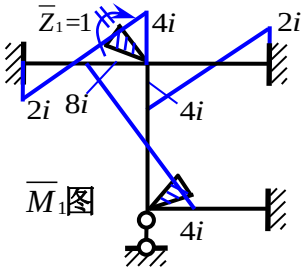


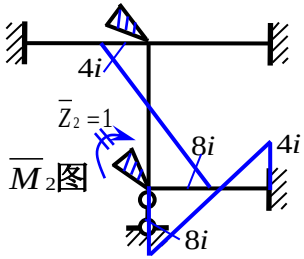
【例题60】用位移法作弯矩图。（刚架7-19）











$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

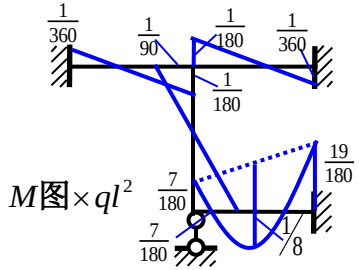
令线刚度：$i=EI/l$　$k_{11}=16i$　$k_{22}=16i$　$k_{12}=k_{21}=4i$

$F_{1P}=0$　$F_{2P}=-ql^2/12$　$16iZ_1+4iZ_2=0$

$4iZ_1+16iZ_2-ql^2/12=0$

$Z_1=\dfrac{-ql^2}{720i}$　$Z_2=\dfrac{ql^2}{180i}$

$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$



【例题53】用位移法作弯矩图。（刚架7-2）

令线刚度：$i = EI/l$

$$\begin{aligned} k_{11}Z_1 + k_{12}Z_2 + F_{1P} &= 0 \\ k_{21}Z_1 + k_{22}Z_2 + F_{2P} &= 0 \end{aligned} \qquad M = \overline{M}_1 Z_1 + \overline{M}_2 Z_2 + M_P$$

【例题54】用位移法作弯矩图。（刚架7-2）