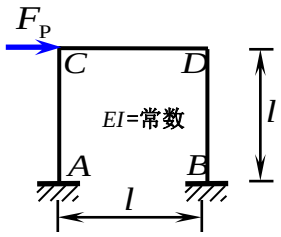
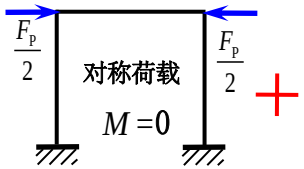
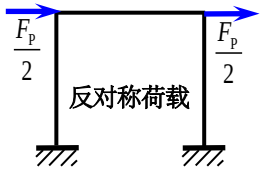
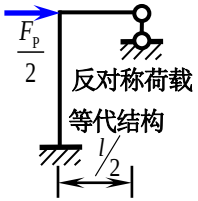
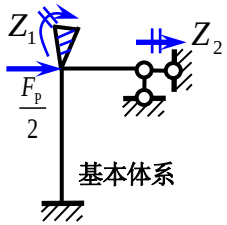
【例题1】用位移法作弯矩图。（对称1-1）







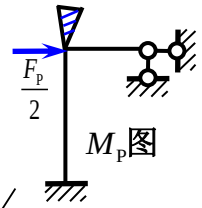


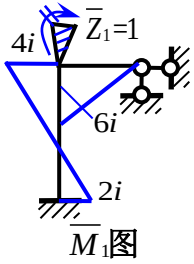


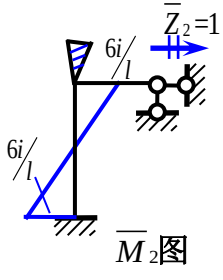
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=\frac{EI}{l}$

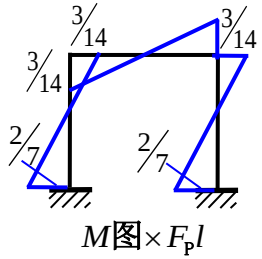
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　$k_{11}=10i$　$k_{22}=\frac{12i}{l^2}$

$k_{21}=k_{12}=\frac{-6i}{l}$　$F_{1P}=0$　$F_{2P}=\frac{-F_P l}{2}$





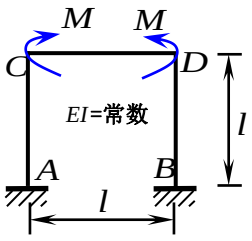


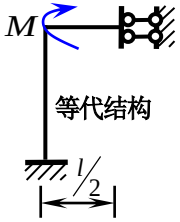


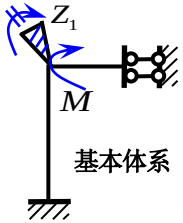
$10iZ_1-\frac{6i}{l}Z_2=0$　$Z_1=\frac{F_P l}{28i}$　$Z_2=\frac{5F_P l^2}{84i}$

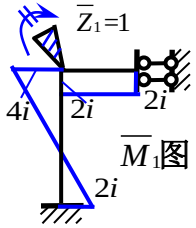
$-\frac{6i}{l}Z_1+\frac{12i}{l^2}Z_2-\frac{F_P l}{2}=0$　$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

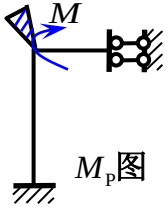
【例题2】用位移法作弯矩图。（对称1-2）

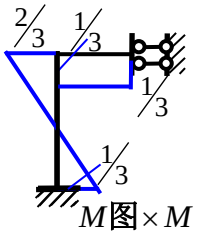


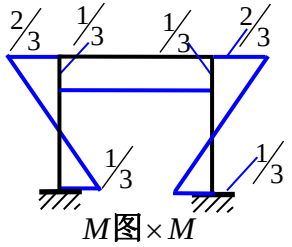








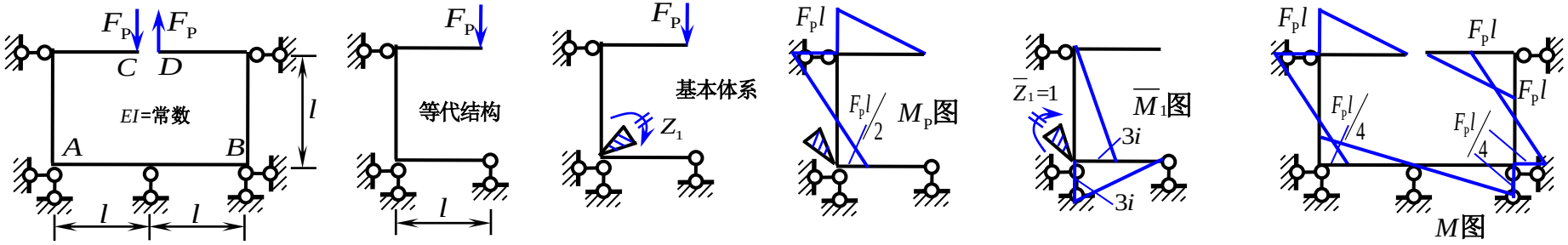




$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=\frac{EI}{l}$

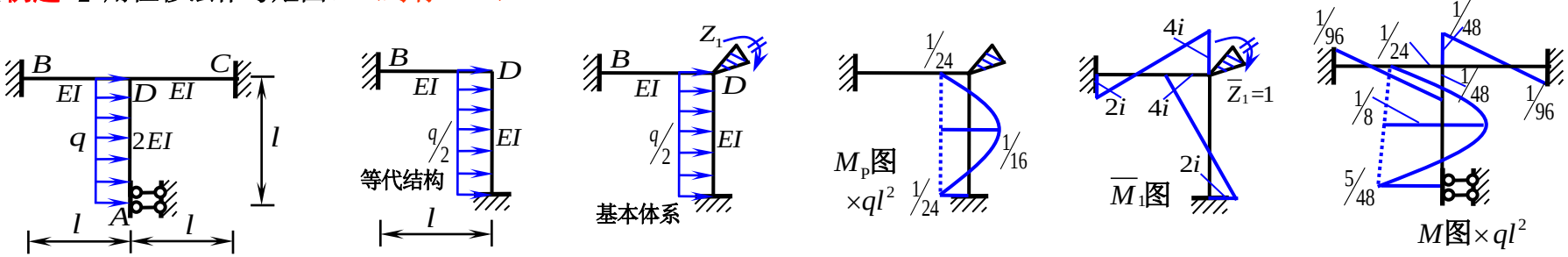
$k_{11}=6i$　$F_{1P}=-M$　$Z_1=\frac{M}{6i}$　$M=\bar{M}_1Z_1+M_P$

【例题3】用位移法作弯矩图。（对称1-20）



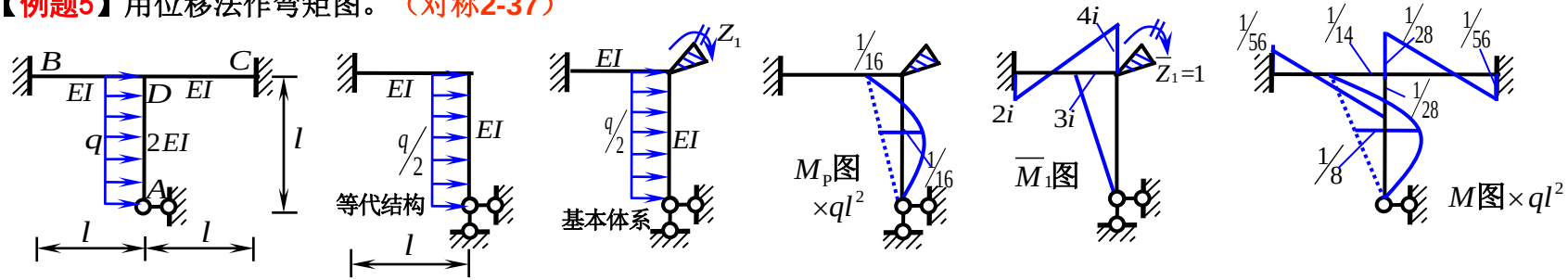
令线刚度：$i=EI/l$　　$k_{11}Z_1+F_{1P}=0$　　$k_{11}=6i$　　$F_{1P}=\dfrac{F_Pl}{2}$　　$Z_1=\dfrac{-F_Pl}{12i}$　　$M=\overline{M}_1Z_1+M_P$

【例题4】用位移法作弯矩图。（对称2-29）



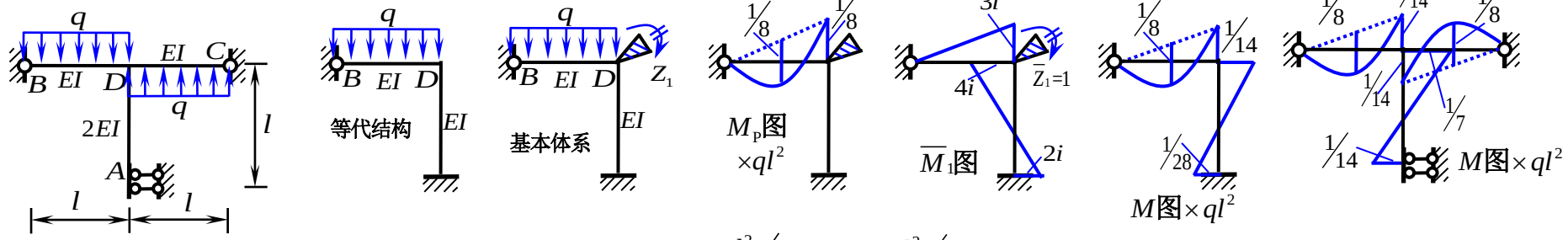
令线刚度：$i=EI/l$　　$k_{11}Z_1+F_{1P}=0$　　$k_{11}=8i$　　$F_{1P}=\dfrac{ql^2}{24}$　　$Z_1=\dfrac{-ql^2}{192i}$　　$M=\overline{M}_1Z_1+M_P$

【例题5】用位移法作弯矩图。（对称2-37）



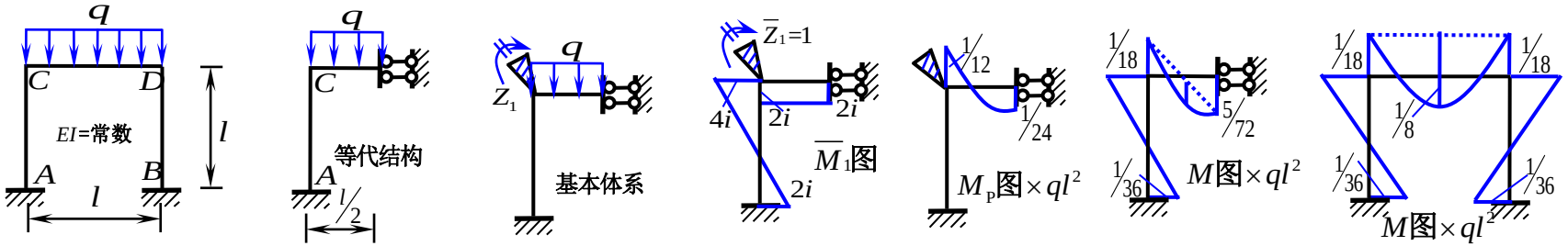
令线刚度：$i=EI/l$　　$k_{11}Z_1+F_{1P}=0$　　$k_{11}=7i$　　$F_{1P}=\dfrac{ql^2}{16}$　　$Z_1=\dfrac{-ql^2}{112i}$　　$M=\overline{M}_1Z_1+M_P$

【例题6】用位移法作弯矩图。（对称2-40）



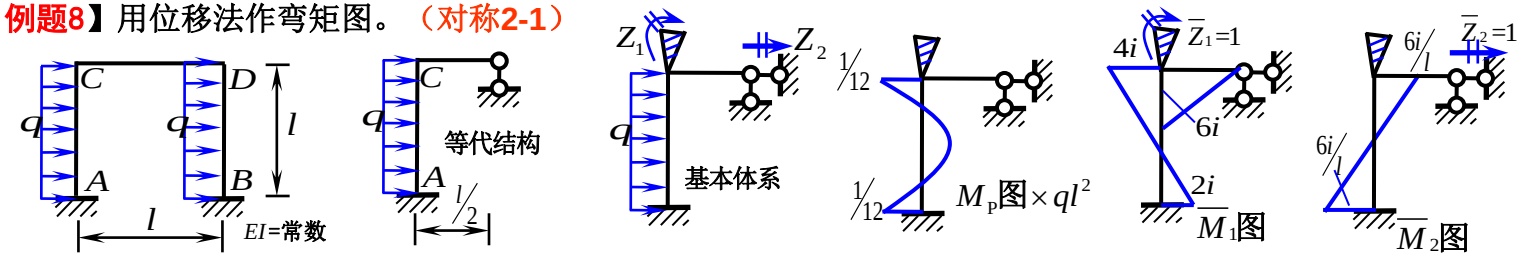
令线刚度：$i=EI/l$　$k_{11}Z_1+F_{1P}=0$　$k_{11}=7i$　$F_{1P}=ql^2/8$　$Z_1=-ql^2/56i$　$M=\overline{M}_1Z_1+M_P$

【例题7】用位移法作弯矩图。（对称2-2）



令线刚度：$i=EI/l$　$k_{11}Z_1+F_{1P}=0$　$k_{11}=6i$　$F_{1P}=-ql^2/12$　$Z_1=ql^2/72i$　$M=\overline{M}_1Z_1+M_P$

【例题8】用位移法作弯矩图。（对称2-1）



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

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

令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=-6i/l$

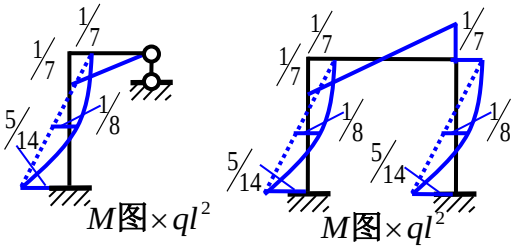
$F_{1P}=ql^2/12$　$F_{2P}=-ql/2$

$10iZ_1-6i/l\,Z_2+ql^2/12=0$

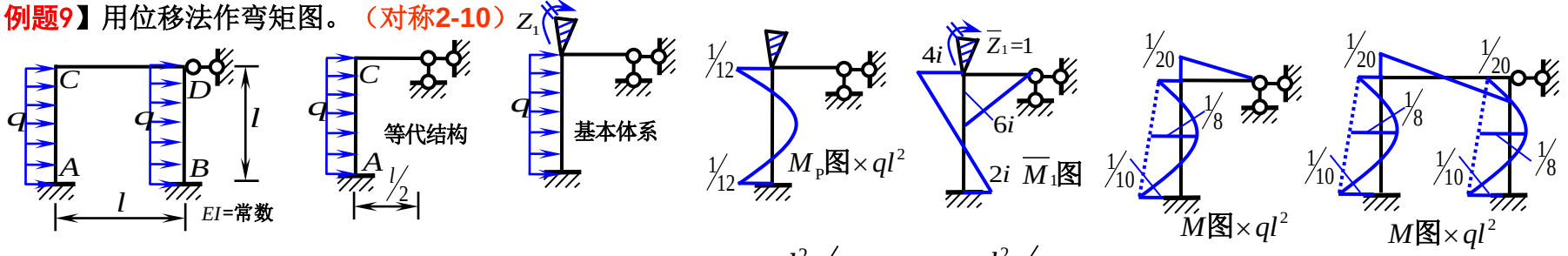
$-6i/l\,Z_1+12i/l^2\,Z_2-ql/2=0$

$Z_1=ql^2/42i$　$Z_2=3ql^3/56i$

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

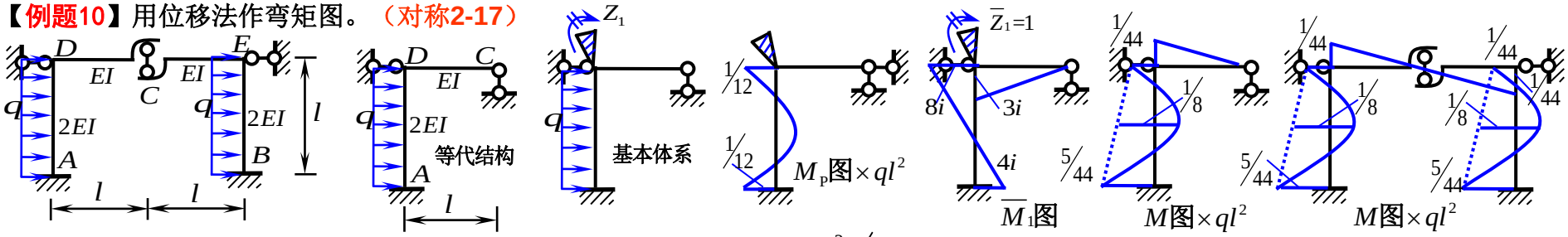


【例题9】用位移法作弯矩图。（对称2-10）



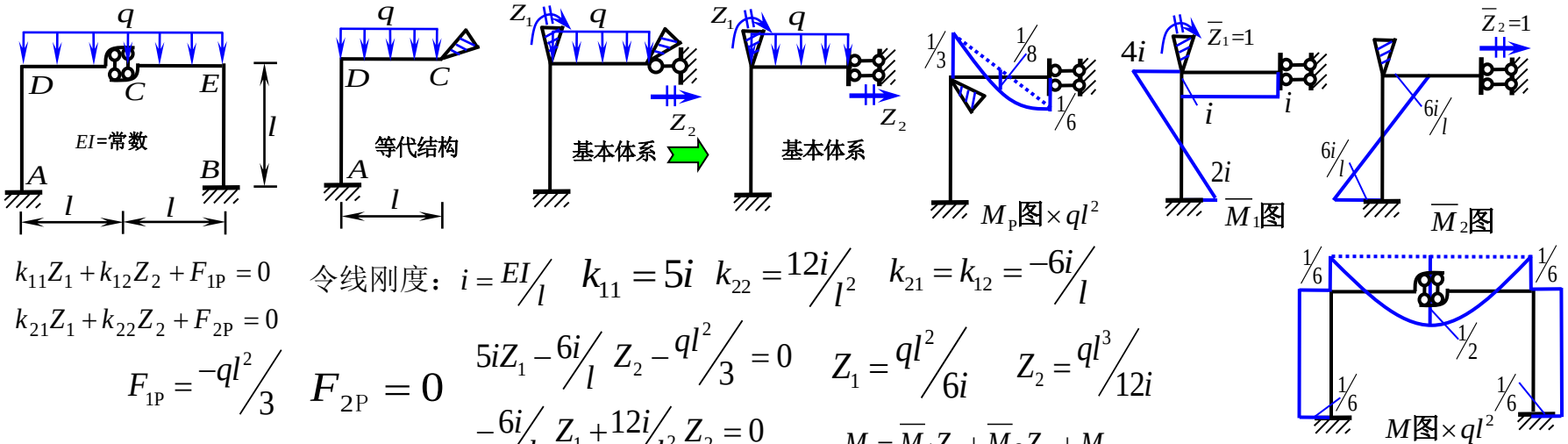
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$F_{1P}=ql^2/12$　$Z_1=-ql^2/120i$　$M=\overline{M}_1Z_1+M_P$

【例题10】用位移法作弯矩图。（对称2-17）



$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=11i$　$F_{1P}=ql^2/12$　$Z_1=-ql^2/132i$　$M=\overline{M}_1Z_1+M_P$

【例题11】用位移法作弯矩图。（对称2-21）



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

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

令线刚度：$i=EI/l$　$k_{11}=5i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=-6i/l$

$F_{1P}=-ql^2/3$　$F_{2P}=0$

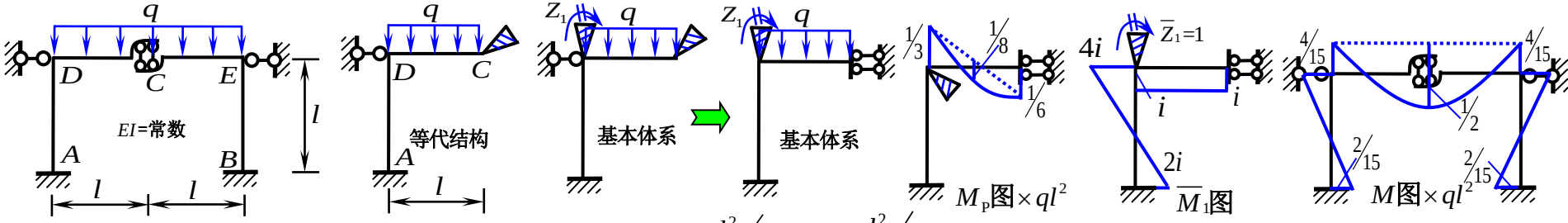
$5iZ_1-6i/l\ Z_2-ql^2/3=0$

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

$Z_1=ql^2/6i$　$Z_2=ql^3/12i$

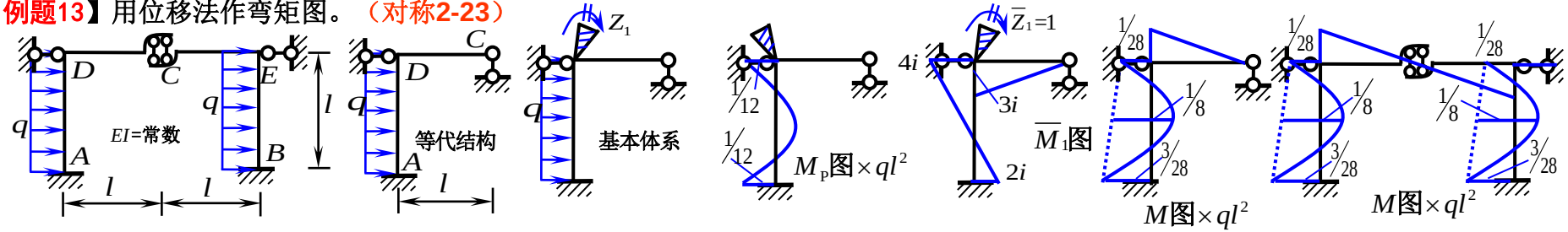
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

【例题12】用位移法作弯矩图。（对称2-22）



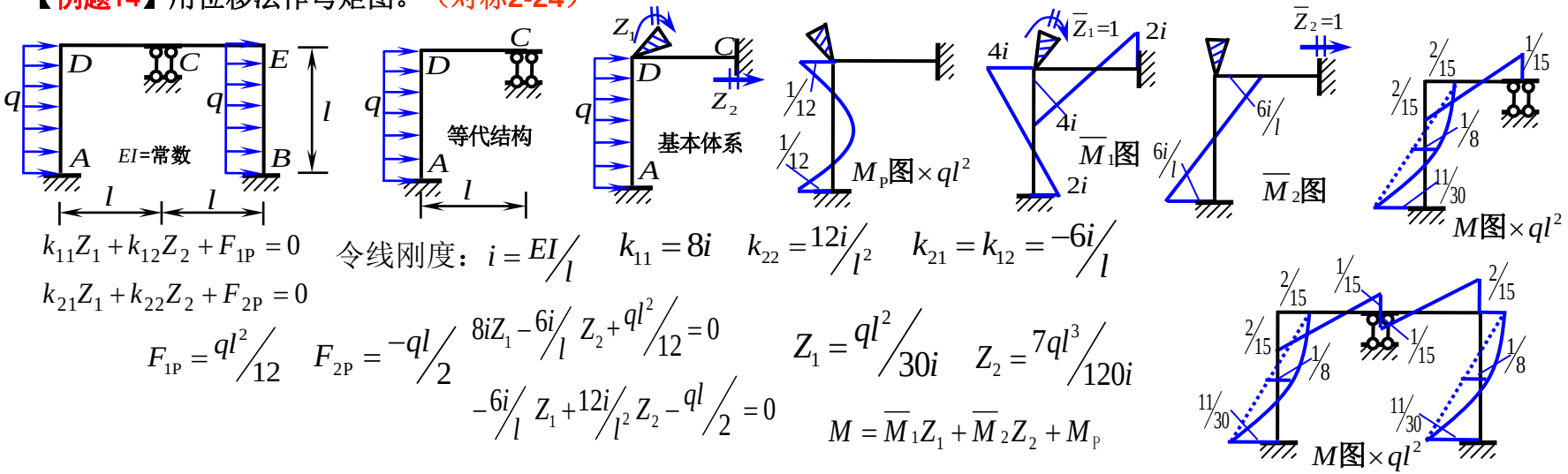
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$F_{1P}=-ql^2/3$　$Z_1=ql^2/15i$　$M=\overline{M}_1Z_1+M_P$

【例题13】用位移法作弯矩图。（对称2-23）



$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$F_{1P}=ql^2/12$　$Z_1=-ql^2/84i$　$M=\overline{M}_1Z_1+M_P$

【例题14】用位移法作弯矩图。（对称2-24）



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

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

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

$F_{1P}=ql^2/12$　$F_{2P}=-ql/2$

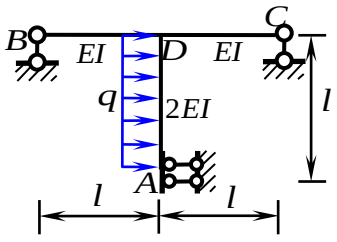
$8iZ_1-6i/l\ Z_2+ql^2/12=0$

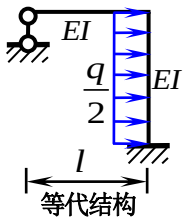
$-6i/l\ Z_1+12i/l^2\ Z_2-ql/2=0$

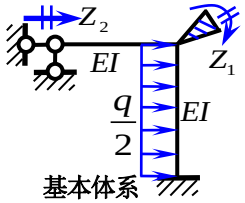
$Z_1=ql^2/30i$　$Z_2=7ql^3/120i$

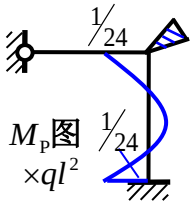
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

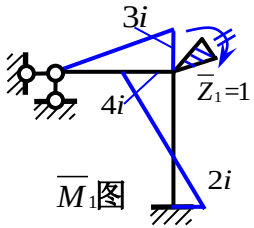
【例题15】用位移法作弯矩图。（对称2-26）

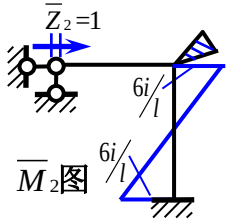


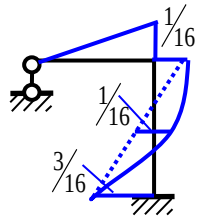












$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

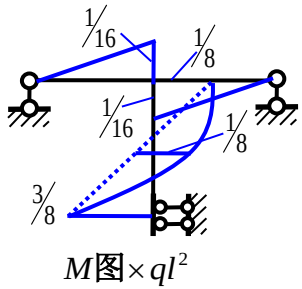
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=-6i/l$

$$F_{1P}=ql^2/24 \qquad F_{2P}=-ql/4$$

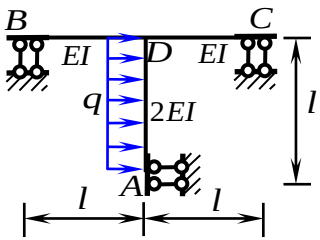
$$7iZ_1-6i/l\,Z_2+ql^2/24=0$$
$$-6i/l\,Z_1+12i/l^2\,Z_2-ql/4=0$$

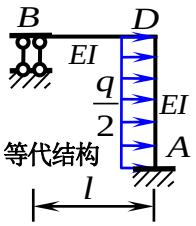
$$Z_1=ql^2/48i \qquad Z_2=ql^3/32i$$

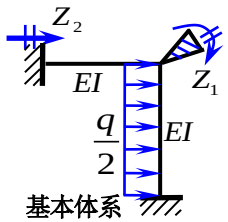
$$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

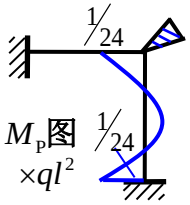


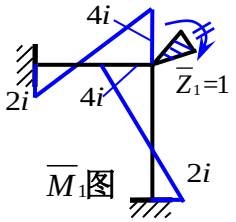
【例题16】用位移法作弯矩图。（对称2-31）

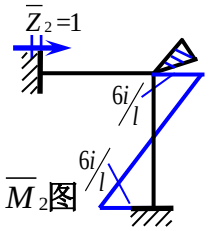












$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

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

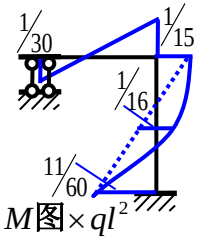
$$k_{21}=k_{12}=-6i/l$$

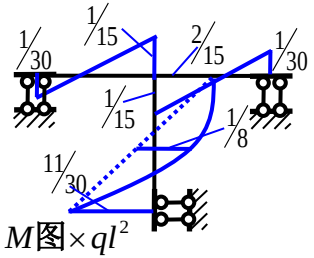
$$F_{1P}=ql^2/24 \qquad F_{2P}=-ql/4$$

$$8iZ_1-6i/l\,Z_2+ql^2/24=0$$
$$-6i/l\,Z_1+12i/l^2\,Z_2-ql/4=0$$

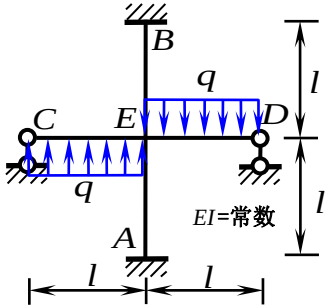
$$Z_1=ql^2/60i \qquad Z_2=7ql^3/240i$$

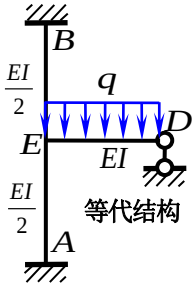
$$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

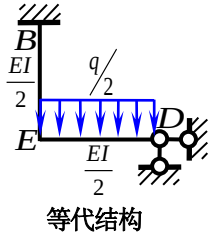


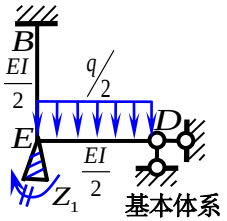


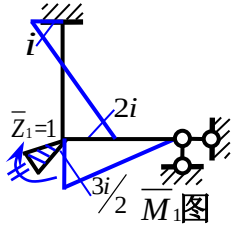
【例题17】用位移法作弯矩图。（对称2-33）

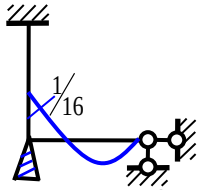






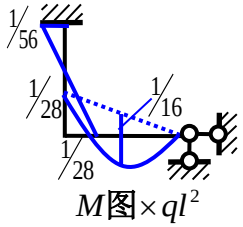


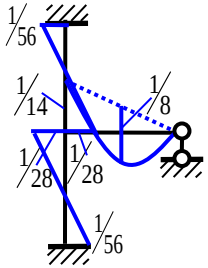


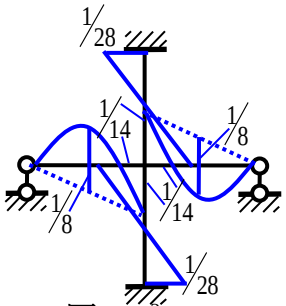


$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$

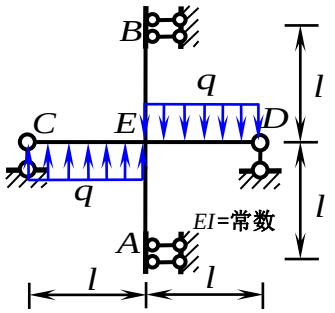
$k_{11}=7i/2$　$F_{1P}=-ql^2/16$　$Z_1=ql^2/56i$　$M=\overline{M}_1Z_1+M_P$

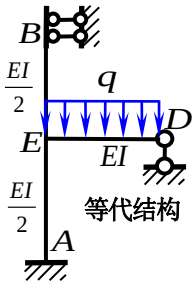


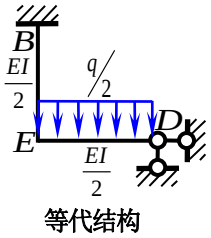


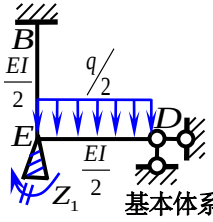


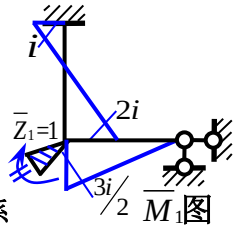
【例题18】用位移法作弯矩图。（对称2-36）

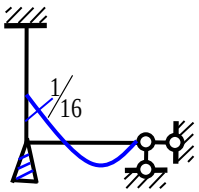






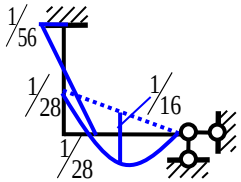


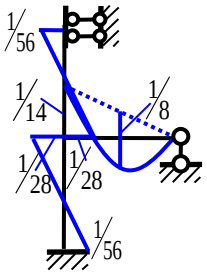


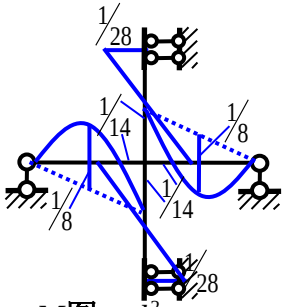


$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i/2$　$F_{1P}=-ql^2/16$

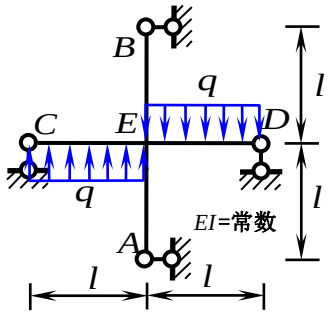
$Z_1=ql^2/56i$　$M=\overline{M}_1Z_1+M_P$

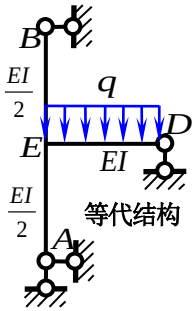


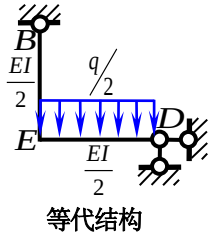


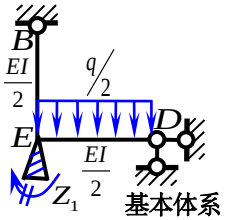


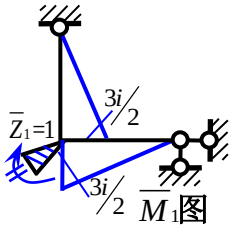
【例题19】用位移法作弯矩图。（对称2-38）

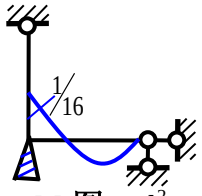






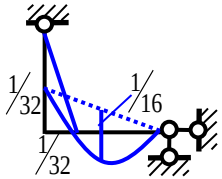


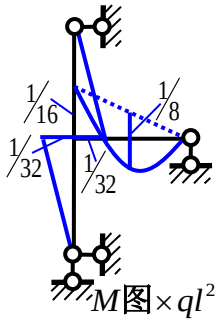


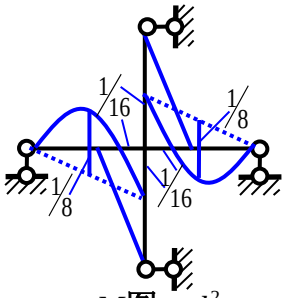


$k_{11}Z_1+F_{1P}=0$　　令线刚度：$i=EI/l$　　$k_{11}=3i$

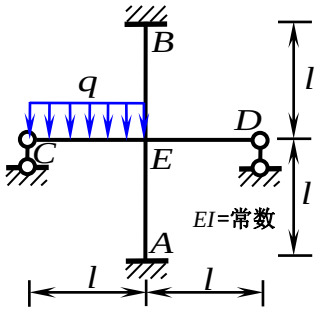
$F_{1P}=-ql^2/16$　　$Z_1=ql^2/48i$　　$M=\overline{M}_1Z_1+M_P$

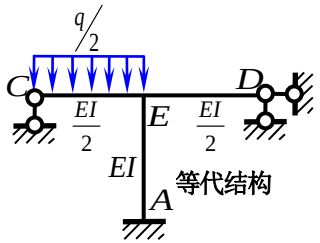


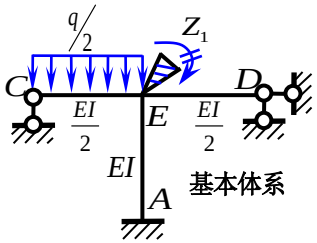


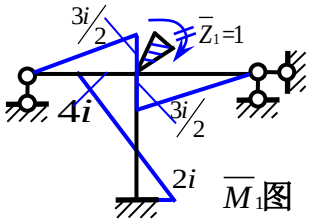


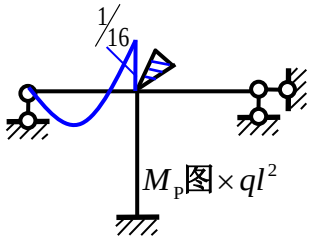
【例题20】用位移法作弯矩图。（对称2-39）





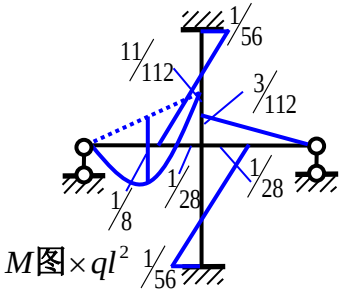




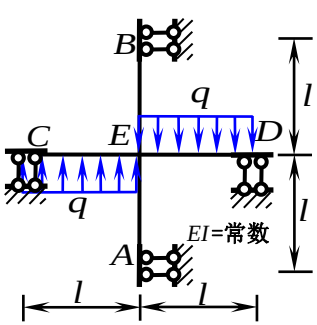


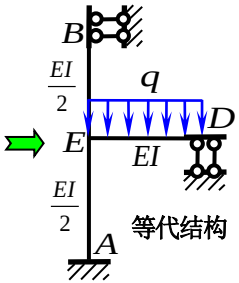
$k_{11}Z_1+F_{1P}=0$　　令线刚度：$i=EI/l$　　$k_{11}=7i$　　$F_{1P}=ql^2/16$　　$Z_1=-ql^2/112i$

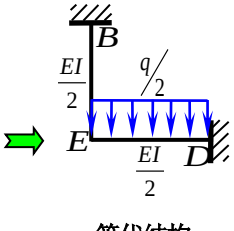
$M=\overline{M}_1Z_1+M_P$

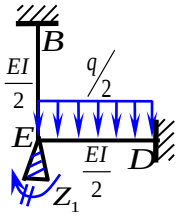


【例题21】用位移法作弯矩图。（对称3-1）

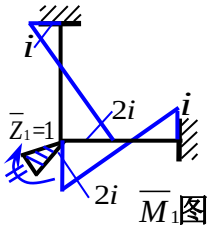




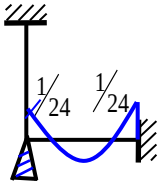




基本体系



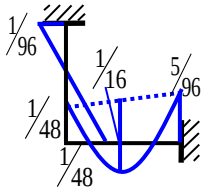
$\overline{M}_1$图



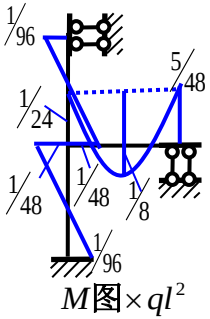
M_P图$\times ql^2$

$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=4i$　$F_{1P}=-ql^2/24$

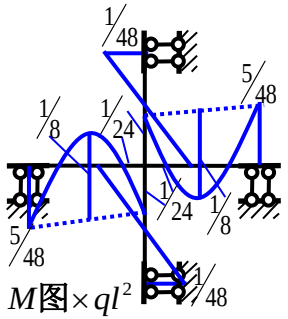
$Z_1=ql^2/96i$　$M=\overline{M}_1Z_1+M_P$



M图$\times ql^2$

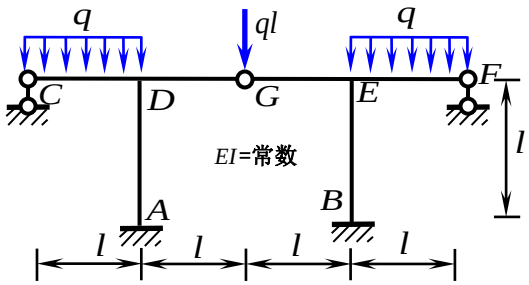


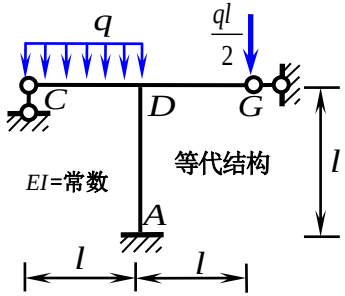
M图$\times ql^2$

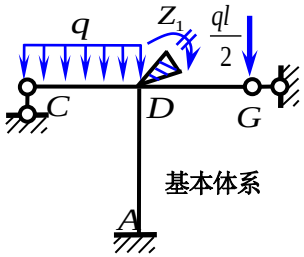


M图$\times ql^2$

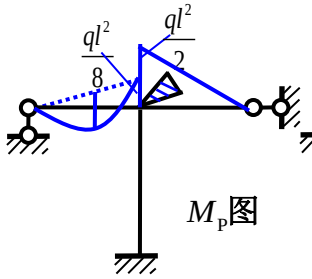
【例题22】用位移法作弯矩图。（对称3-3）



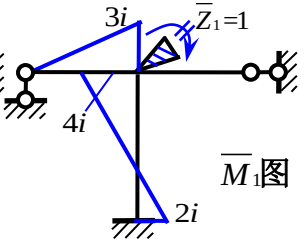




基本体系



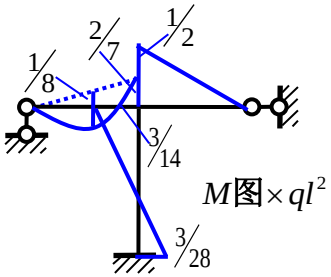
M_P图



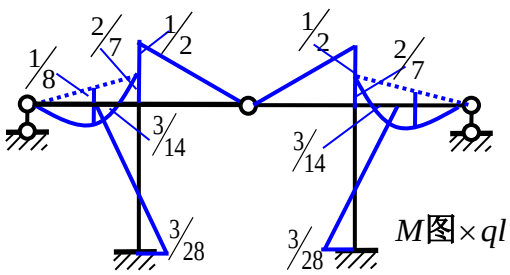
$\overline{M}_1$图

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

$F_{1P}=-3ql^2/8$　$Z_1=3ql^2/56i$　$M=\overline{M}_1Z_1+M_P$

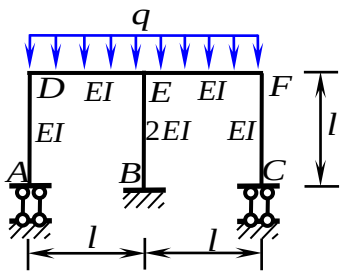


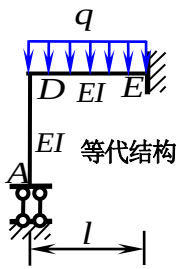
M图$\times ql^2$

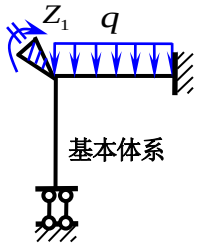


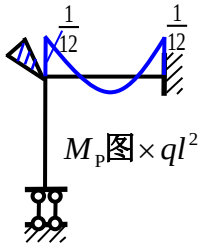
M图$\times ql^2$

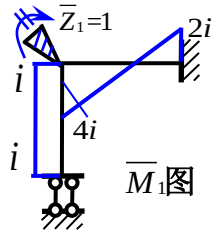
【例题23】用位移法作弯矩图。（对称3-4）

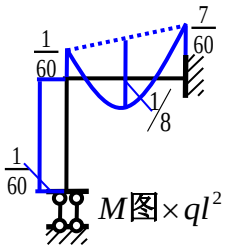






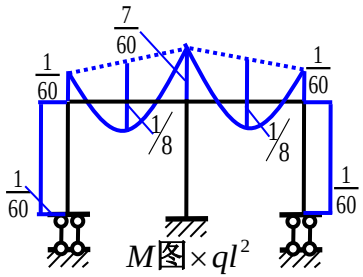




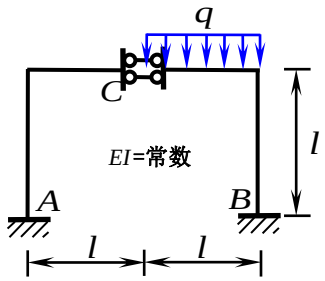


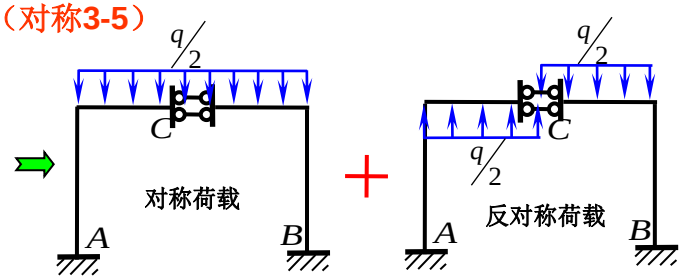
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$

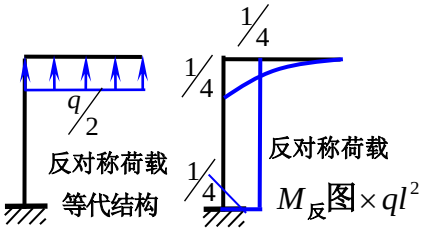
$F_{1P}=-ql^2/12$　$Z_1=ql^2/60i$　$M=\overline{M}_1Z_1+M_P$

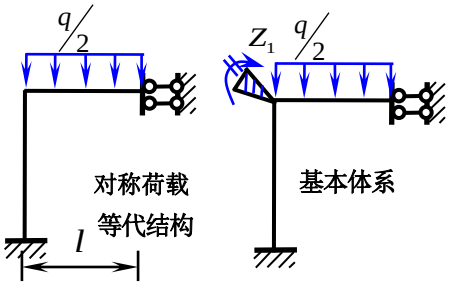


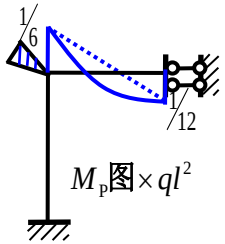
【例题24】用位移法作弯矩图。（对称3-5）

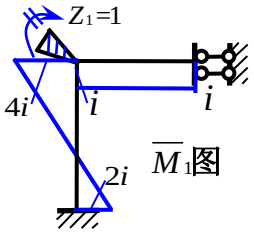


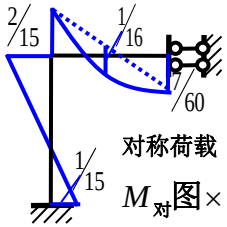


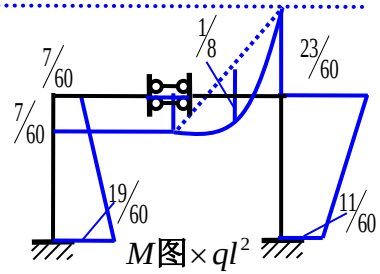






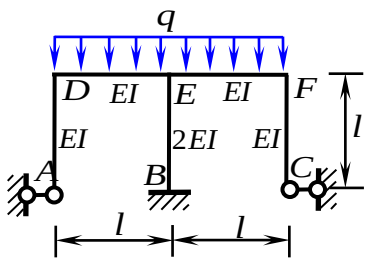


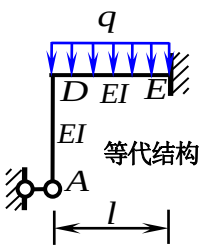


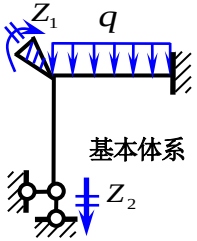


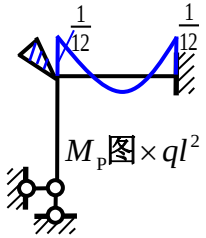
$k_{11}Z_1+F_{1P}=0$ 令线刚度：$i=EI/l$　$k_{11}=5i$　$F_{1P}=-ql^2/6$　$Z_1=ql^2/30i$　$M=\overline{M}_1Z_1+M_P$

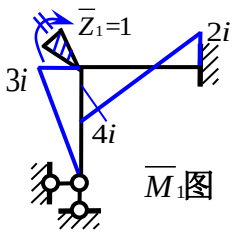
【例题25】用位移法作弯矩图。（对称3-7）

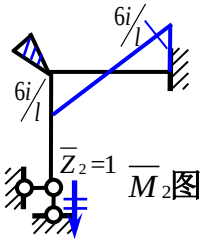


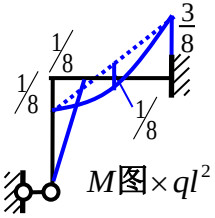












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

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

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

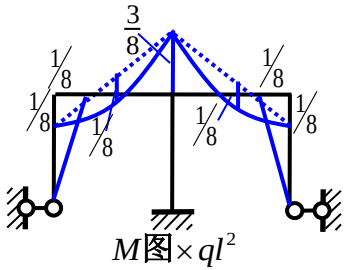
$F_{1P}=-ql^2/12$　$F_{2P}=-ql/2$

$7iZ_1+6i/l\,Z_2-ql^2/12=0$

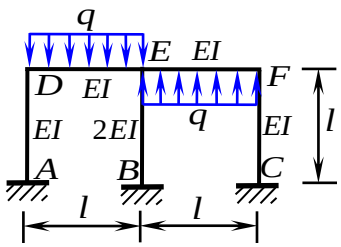
$6i/l\,Z_1+12i/l^2\,Z_2-ql/2=0$

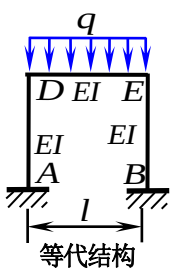
$Z_1=\dfrac{-ql^2}{24i}$　$Z_2=\dfrac{ql^3}{16i}$

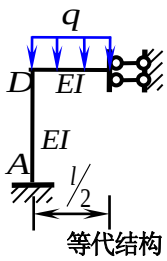
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

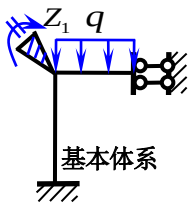


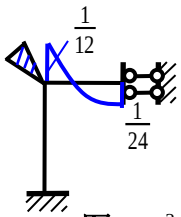
【例题26】用位移法作弯矩图。（对称3-11）

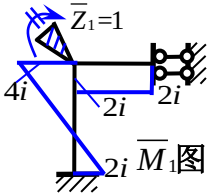








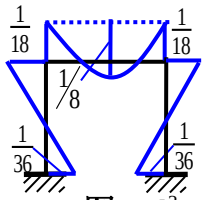


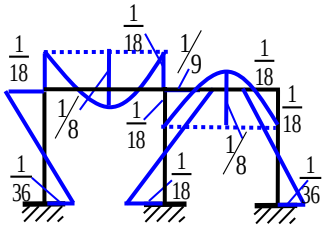


$k_{11}Z_1+F_{1P}=0$

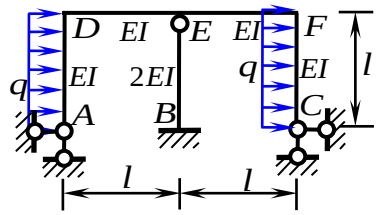
令线刚度：$i=EI/l$　$k_{11}=6i$

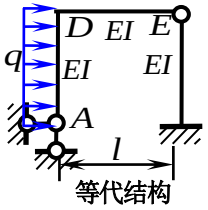
$F_{1P}=-ql^2/12$　$Z_1=ql^2/72i$　$M=\overline{M}_1Z_1+M_P$

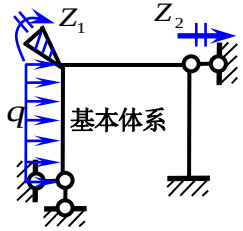


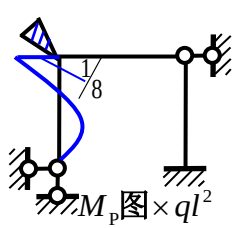


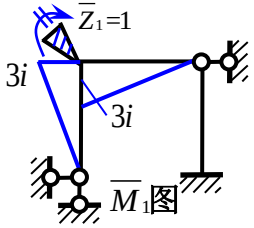
【例题27】用位移法作弯矩图。（对称3-12）

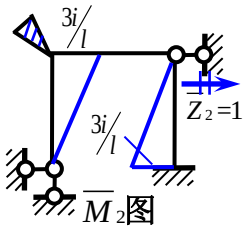












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

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

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

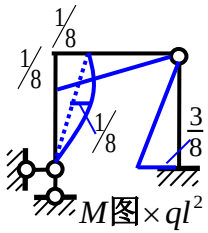
$k_{21}=k_{12}=-3i/l$　　$F_{1P}=ql^2/8$　　$F_{2P}=-5ql/8$

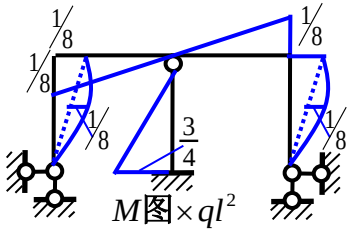
$6iZ_1-3i/l\,Z_2+ql^2/8=0$

$-3i/l\,Z_1+6i/l^2\,Z_2-5ql/8=0$

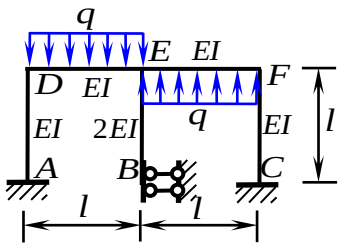
$Z_1=\dfrac{ql^2}{24i}$　　$Z_2=\dfrac{ql^3}{8i}$

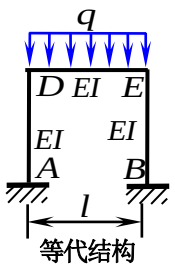
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

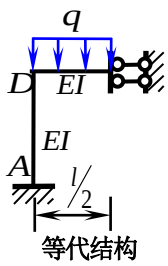


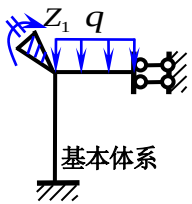


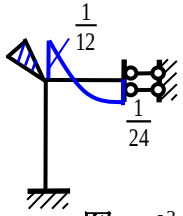
【例题28】用位移法作弯矩图。（对称3-13）

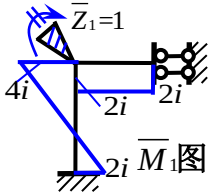


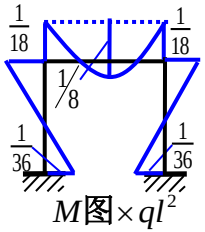






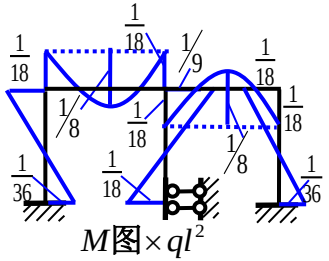




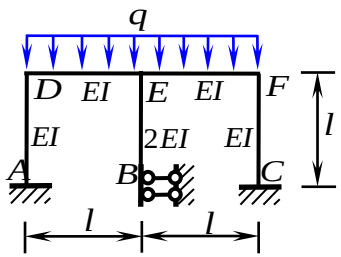


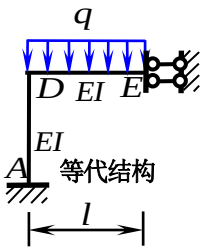
$M=\overline{M}_1Z_1+M_P$　　令线刚度：$i=EI/l$　　$k_{11}=6i$　　$F_{1P}=-ql^2/12$

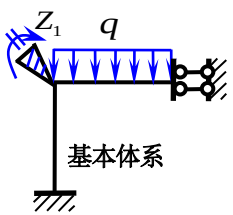
$Z_1=ql^2/72i$　　$k_{11}Z_1+F_{1P}=0$

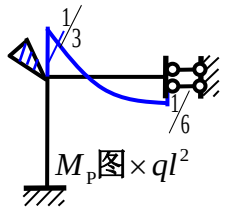


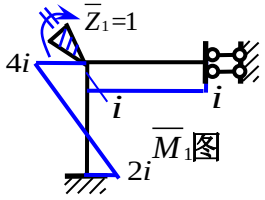
【例题29】用位移法作弯矩图。（对称3-14）

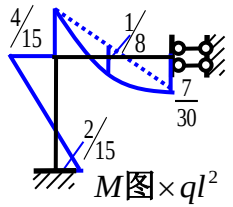






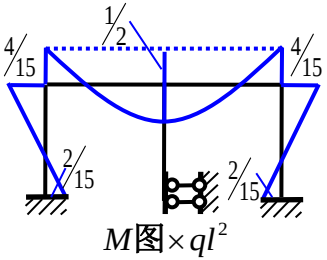


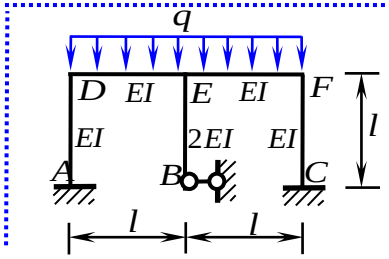




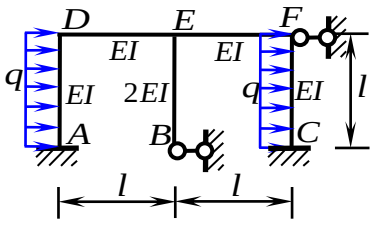
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$F_{1P}=-ql^2/3$

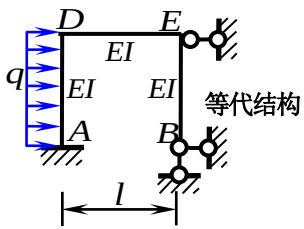
$Z_1=ql^2/15i$　$M=\overline{M}_1Z_1+M_P$

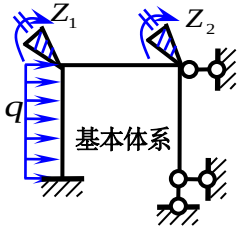


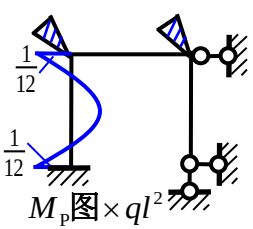


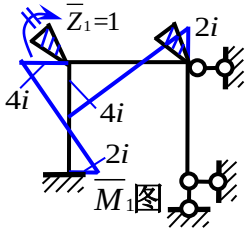
【例题30】用位移法作弯矩图。（对称3-2）

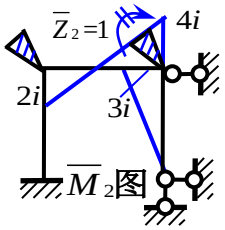












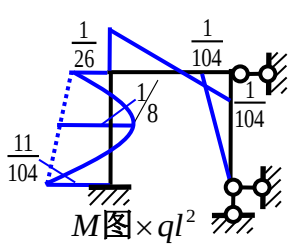
$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=8i$　$k_{22}=7i$

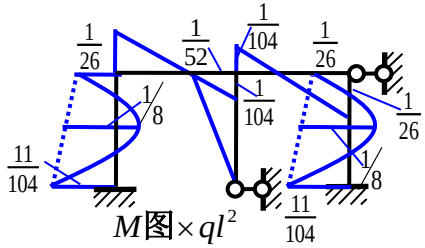
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

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

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

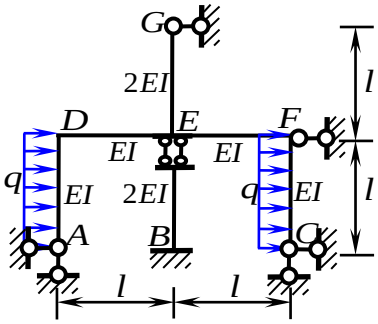
$2iZ_1+7iZ_2=0$

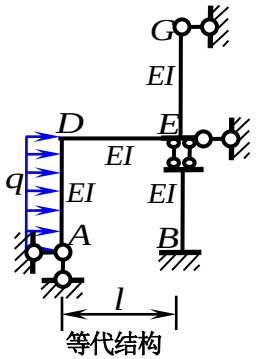


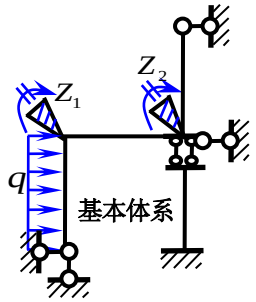


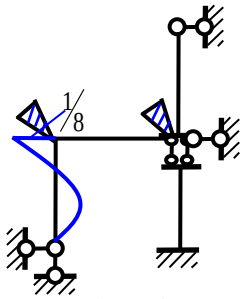
$$Z_1=\frac{-7ql^2}{624i}\qquad Z_2=\frac{ql^2}{312i}\qquad M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$

【例题31】用位移法作弯矩图。（对称3-20）

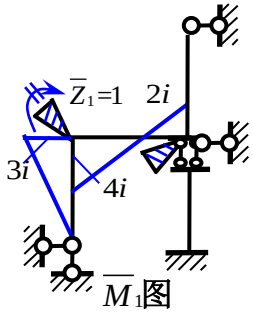




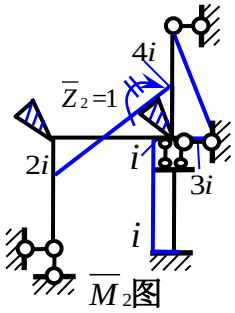




M_P图$\times ql^2$



$\overline{M}_1$图



$\overline{M}_2$图

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

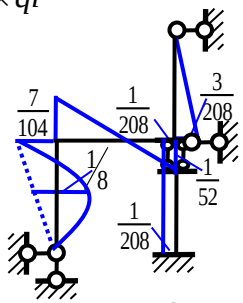
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

$k_{21}=k_{12}=2i$　$F_{1P}=ql^2/8$　$F_{2P}=0$

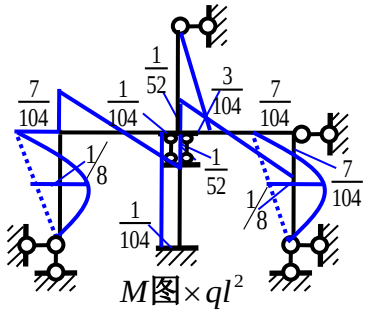
$7iZ_1+2iZ_2+ql^2/8=0$

$2iZ_1+8iZ_2=0$

$Z_1=\dfrac{-ql^2}{52i}$　$Z_2=\dfrac{ql^2}{208i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

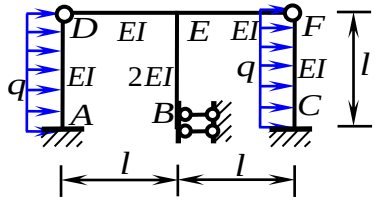


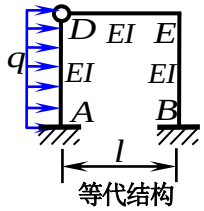
M图$\times ql^2$

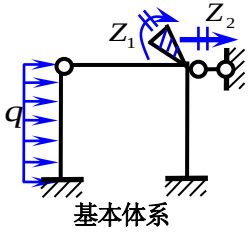


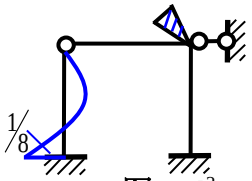
M图$\times ql^2$

【例题32】用位移法作弯矩图。（对称3-21）

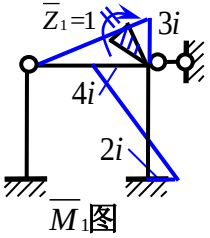




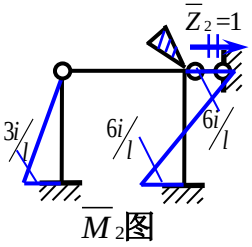




M_P图$\times ql^2$



$\overline{M}_1$图



$\overline{M}_2$图

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

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

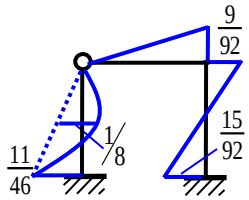
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=15i/l^2$

$k_{21}=k_{12}=-6i/l$　$F_{1P}=0$　$F_{2P}=-3ql/8$

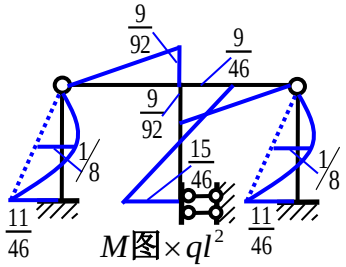
$7iZ_1-6i/l\,Z_2=0$

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

$Z_1=\dfrac{3ql^2}{92i}$　$Z_2=\dfrac{7ql^3}{184i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

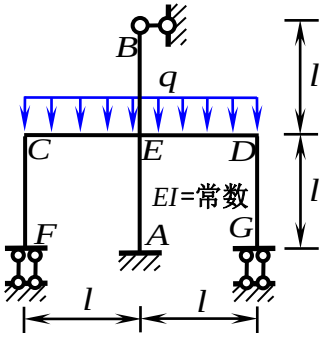


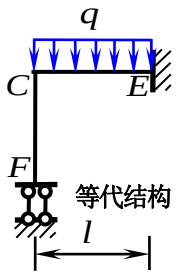
M图$\times ql^2$

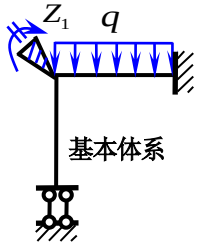


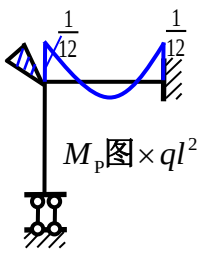
M图$\times ql^2$

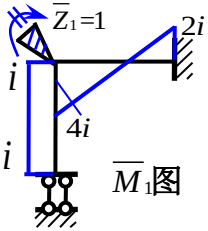
【例题33】用位移法作弯矩图。（对称3-22）

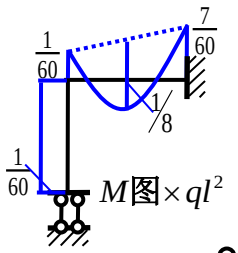


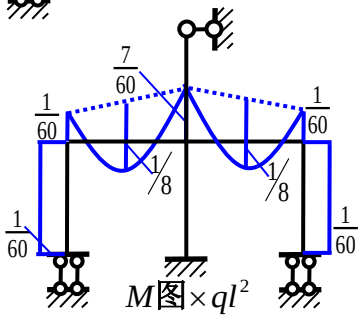








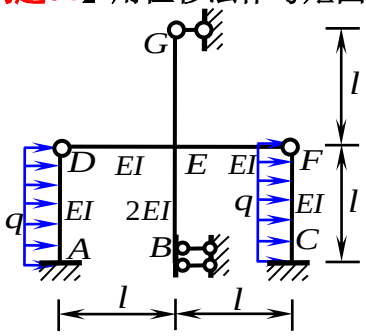


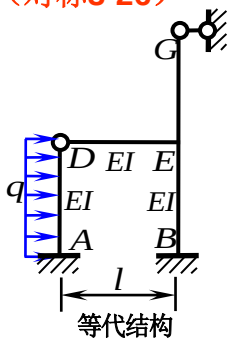


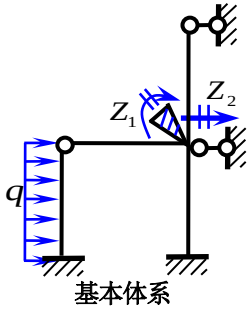
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=5i$　$F_{1P}=-ql^2/12$

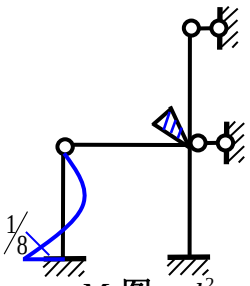
$Z_1=ql^2/60i$　$M=\overline{M}_1Z_1+M_P$

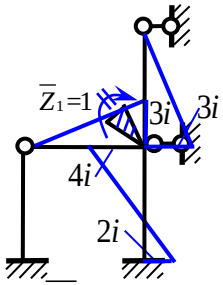
【例题34】用位移法作弯矩图。（对称3-26）

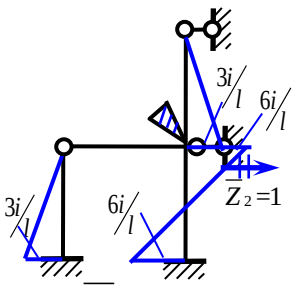












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

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

令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=18i/l^2$　$k_{21}=k_{12}=-3i/l$

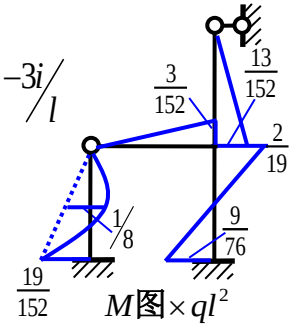
$F_{1P}=0$　$F_{2P}=-3ql/8$

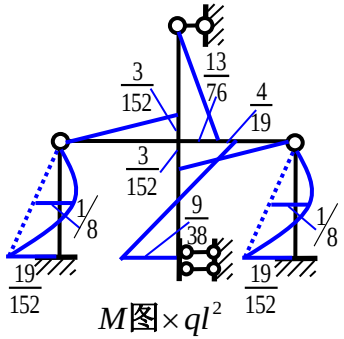
$10iZ_1-3i/l\,Z_2=0$

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

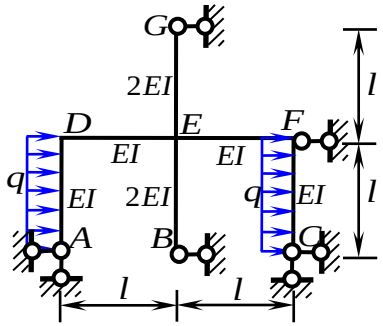
$Z_1=\dfrac{ql^2}{152i}$　$Z_2=\dfrac{5ql^3}{228i}$

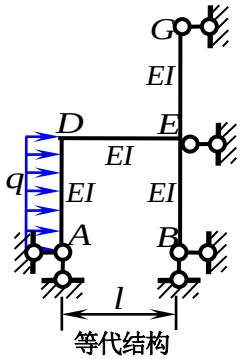
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

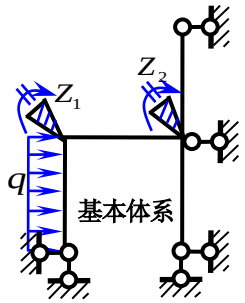


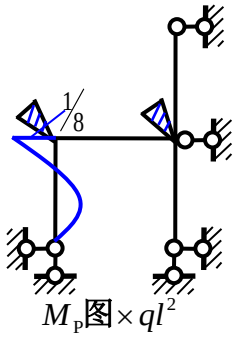


【例题35】用位移法作弯矩图。（对称3-28）

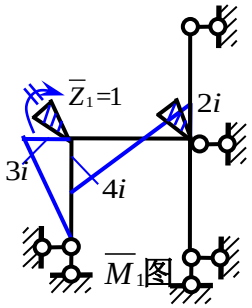




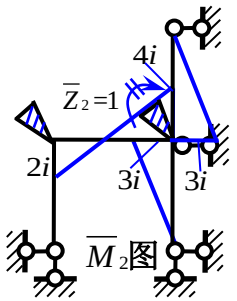




M_P图$\times ql^2$



$\overline{M}_1$图



$\overline{M}_2$图

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

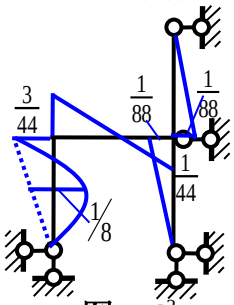
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=10i$　$k_{21}=k_{12}=2i$

$F_{1P}=ql^2/8$　$F_{2P}=0$

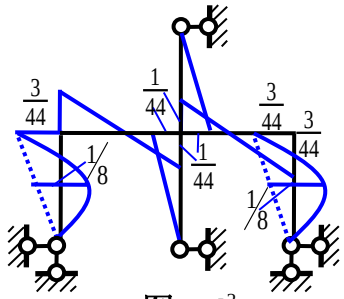
$$7iZ_1+2iZ_2+ql^2/8=0$$
$$2iZ_1+10iZ_2=0$$

$Z_1=\dfrac{-5ql^2}{264i}$　$Z_2=\dfrac{ql^2}{264i}$

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

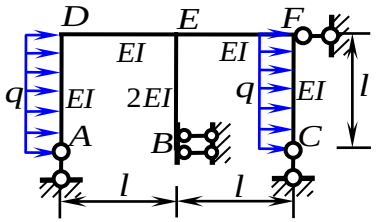


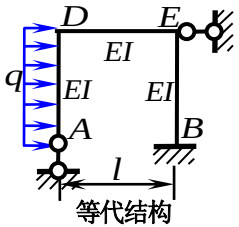
M图$\times ql^2$

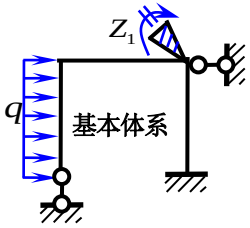


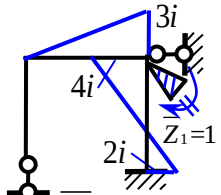
M图$\times ql^2$

【例题36】用位移法作弯矩图。（对称3-29）

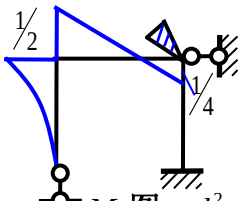




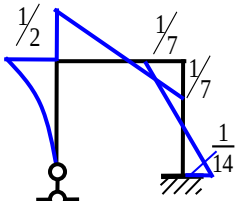




$\overline{M}_1$图



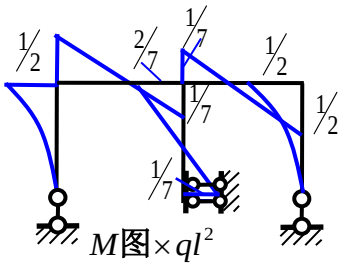
M_P图$\times ql^2$



M图$\times ql^2$

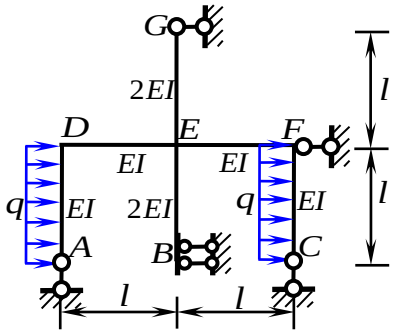
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$F_{1P}=-ql^2/4$

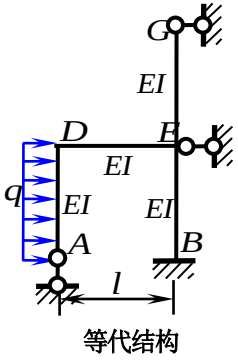
$Z_1=ql^2/28i$　$M=\overline{M}_1Z_1+M_P$



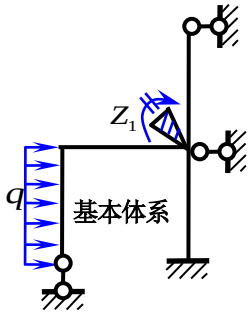
M图$\times ql^2$

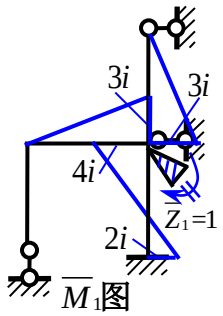
【例题37】用位移法作弯矩图。（对称3-30）



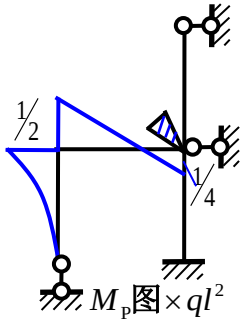


等代结构

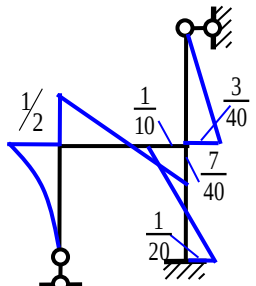




$\overline{M}_1$图



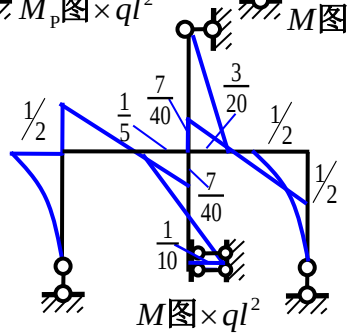
M_P图$\times ql^2$



M图$\times ql^2$

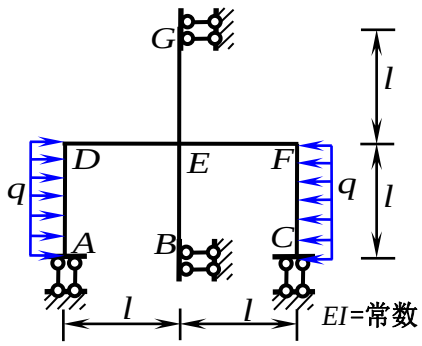
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=10i$　$F_{1P}=-ql^2/4$

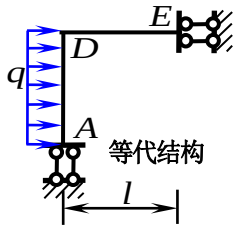
$Z_1=ql^2/40i$　$M=\overline{M}_1Z_1+M_P$



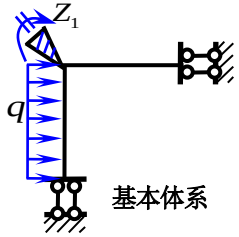
M图$\times ql^2$

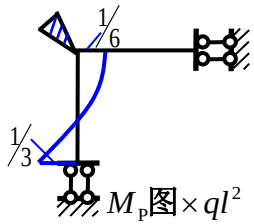
【例题38】用位移法作弯矩图。（对称3-31）



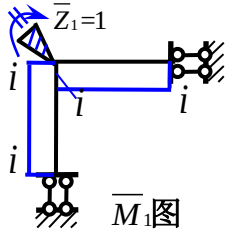


等代结构

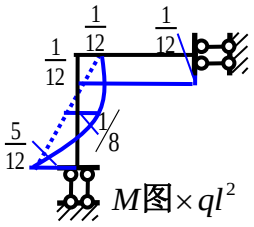




M_P图$\times ql^2$



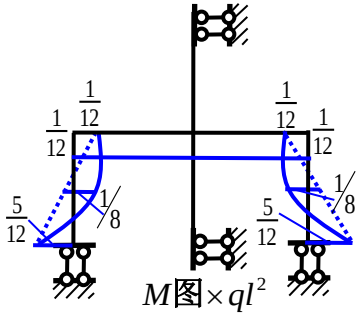
$\overline{M}_1$图



M图$\times ql^2$

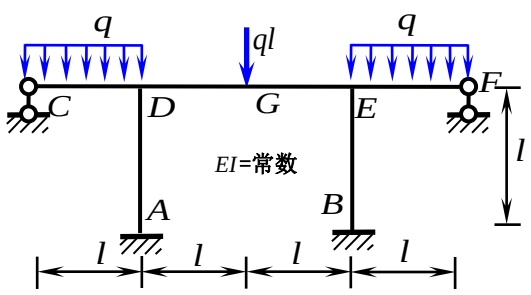
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=2i$　$F_{1P}=-ql^2/6$

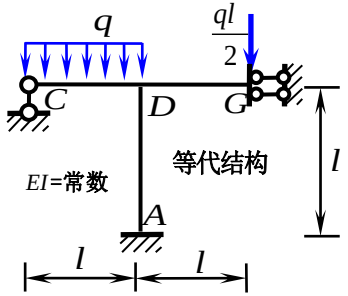
$Z_1=ql^2/12i$　$M=\overline{M}_1Z_1+M_P$

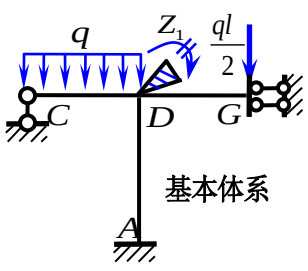


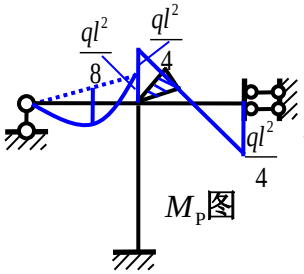
M图$\times ql^2$

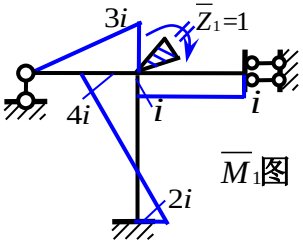
【例题39】用位移法作弯矩图。（对称3-32）





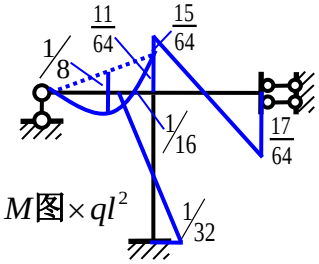


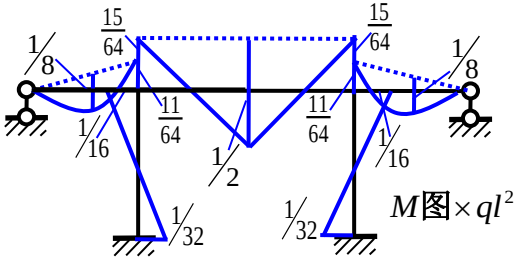




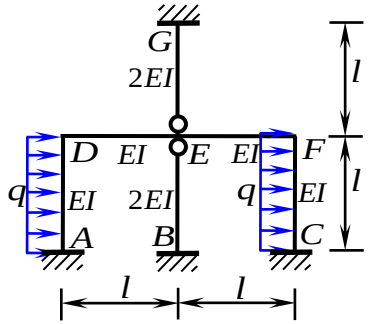
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=8i$

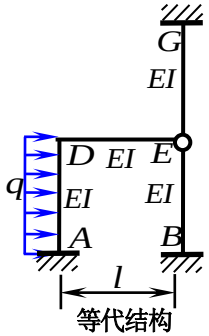
$F_{1P}=-ql^2/8$　$Z_1=ql^2/64i$　$M=\overline{M}_1Z_1+M_P$

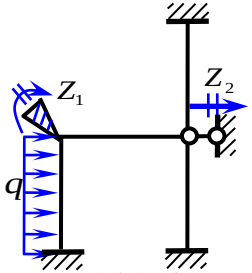


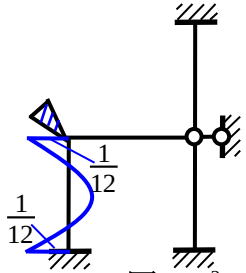


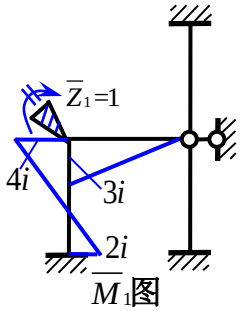
【例题40】用位移法作弯矩图。（对称3-34）

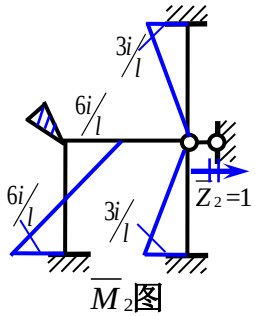












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

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

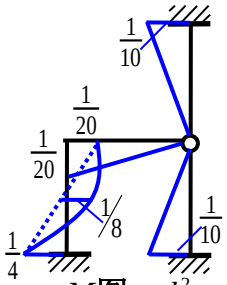
令线刚度：$i=EI/l$　$k_{11}=7i$　$k_{22}=18i/l^2$

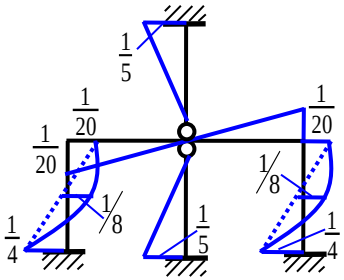
$k_{21}=k_{12}=-6i/l$　$7iZ_1-6i/l\,Z_2+ql^2/12=0$

$F_{1P}=ql^2/12$　$F_{2P}=-ql/2$　$-6i/l\,Z_1+18i/l^2\,Z_2-ql/2=0$

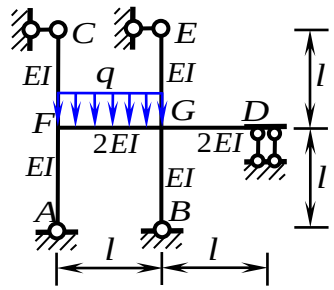
$Z_1=\dfrac{ql^2}{60i}$　$Z_2=\dfrac{ql^3}{30i}$

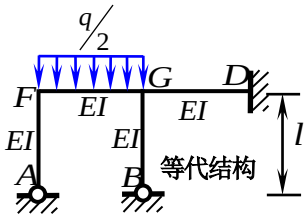
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

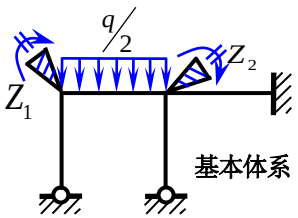


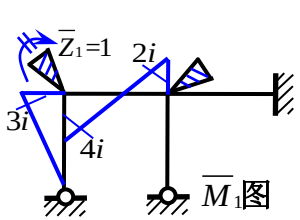


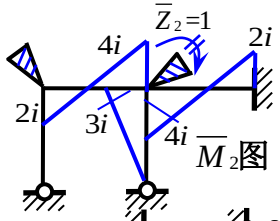
【例题41】用位移法作弯矩图。（对称3-35）

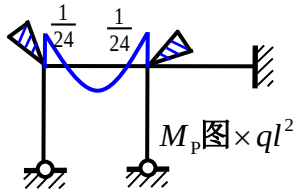


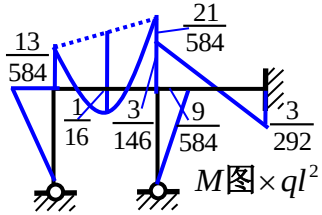


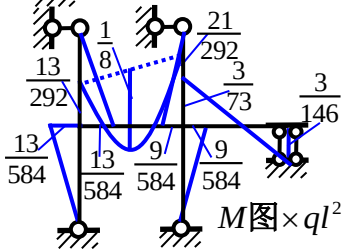












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　　令线刚度：$i=EI/l$

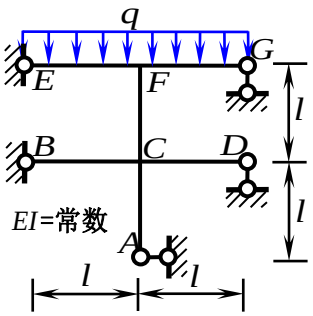
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$　　$k_{11}=7i$　　$k_{22}=11i$

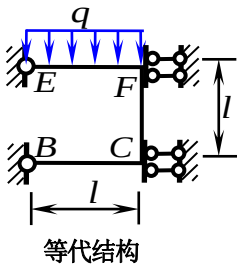
$k_{21}=k_{12}=2i$　　$7iZ_1+2iZ_2-ql^2/24=0$

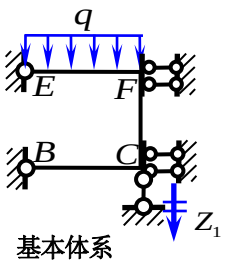
$F_{1P}=-ql^2/24$　　$F_{2P}=ql^2/24$　　$2iZ_1+11iZ_2+ql^2/24=0$　　$Z_1=\dfrac{13ql^2}{1752i}$　　$Z_2=\dfrac{-3ql^2}{584i}$

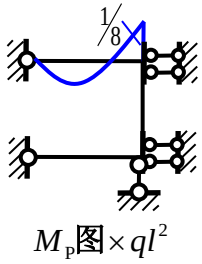
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

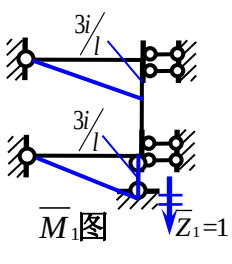
【例题42】用位移法作弯矩图。（对称3-37）

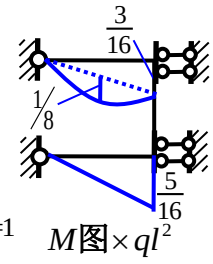






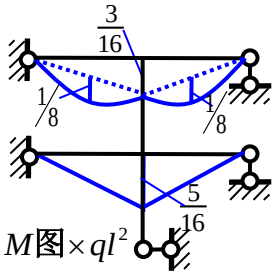


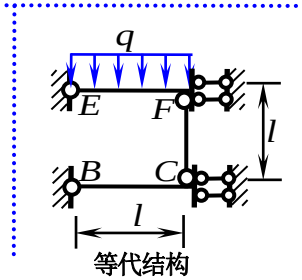




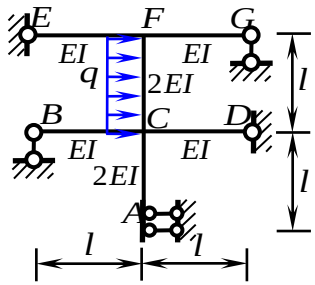
$M=\overline{M}_1Z_1+M_P$　　令线刚度：$i=EI/l$　　$k_{11}=6i/l^2$　　$F_{1P}=-5ql/8$

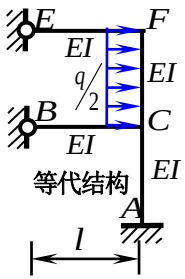
$Z_2=\dfrac{5ql^3}{48i}$　　$k_{11}Z_1+F_{1P}=0$

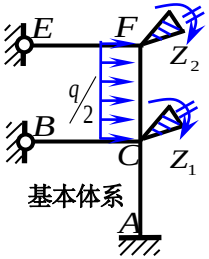


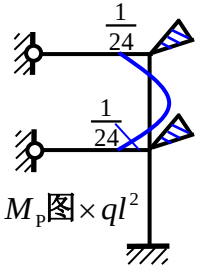


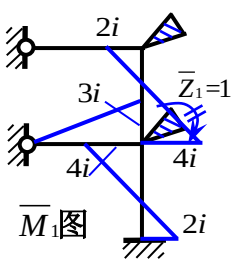
【例题43】用位移法作弯矩图。（对称3-39）

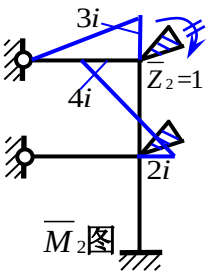


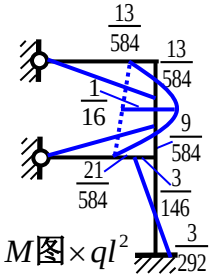












$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

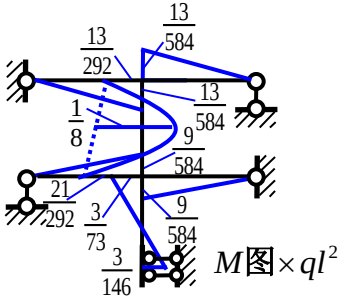
令线刚度：$i=EI/l$　$k_{11}=11i$　$k_{22}=7i$　$k_{21}=k_{12}=2i$

$F_{1P}=-ql^2/24$　$F_{2P}=ql^2/24$

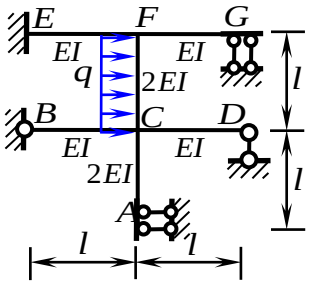
$$11iZ_1+2iZ_2-ql^2/24=0$$
$$2iZ_1+7iZ_2+ql^2/24=0$$

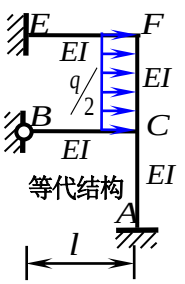
$Z_1=\dfrac{3ql^2}{584i}$　$Z_2=\dfrac{-13ql^2}{1752i}$

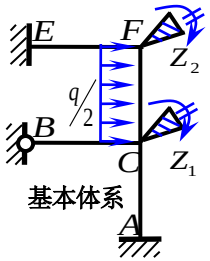
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

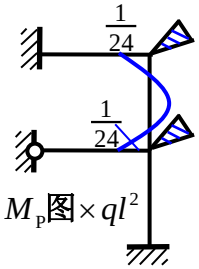


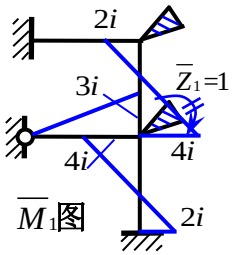
【例题44】用位移法作弯矩图。（对称3-40）

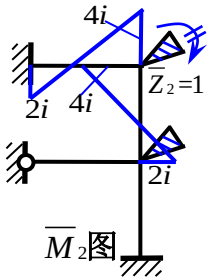


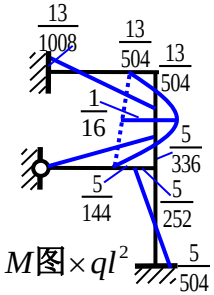












$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

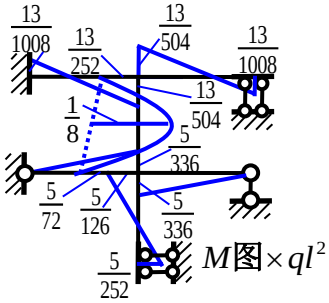
令线刚度：$i=EI/l$　$k_{11}=11i$　$k_{22}=8i$　$k_{21}=k_{12}=2i$

$F_{1P}=-ql^2/24$　$F_{2P}=ql^2/24$

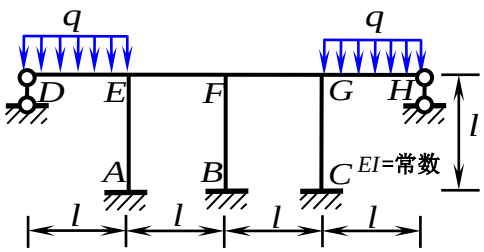
$$11iZ_1+2iZ_2-ql^2/24=0$$
$$2iZ_1+8iZ_2+ql^2/24=0$$

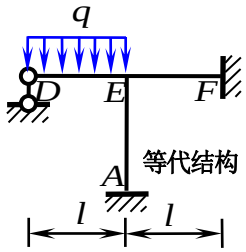
$Z_1=\dfrac{5ql^2}{1008i}$　$Z_2=\dfrac{-13ql^2}{2016i}$

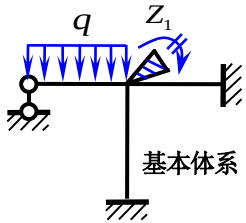
$M=\bar{M}_1Z_1+\bar{M}_2Z_2+M_P$

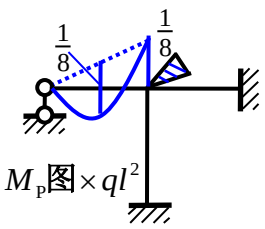


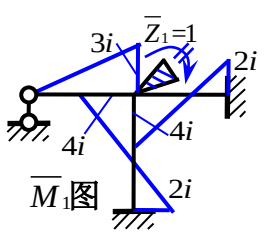
【例题45】用位移法作弯矩图。（对称4-1）





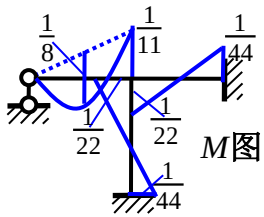


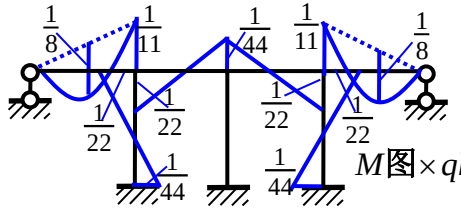




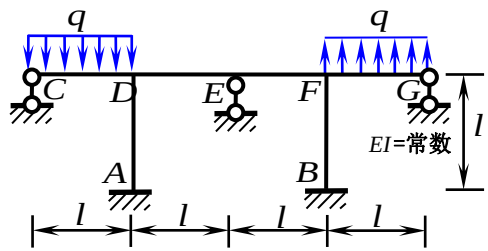
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=11i$　$F_{1P}=ql^2/8$

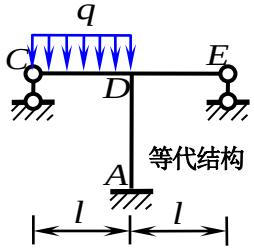
$Z_1=-ql^2/88i$　$M=\overline{M}_1Z_1+M_P$

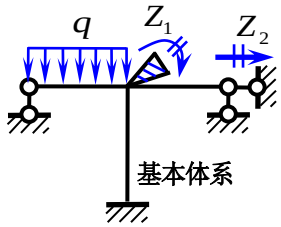


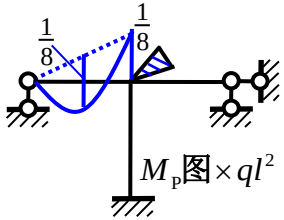


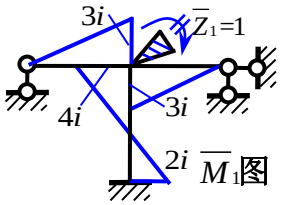
【例题46】用位移法作弯矩图。（对称4-2）





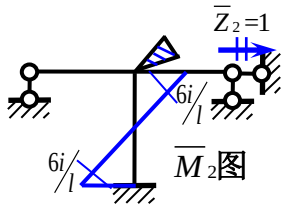


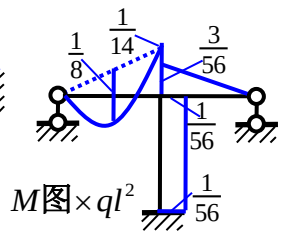


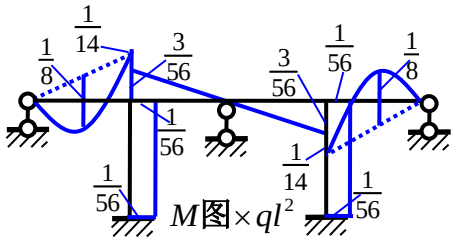


$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$　令线刚度：$i=EI/l$

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







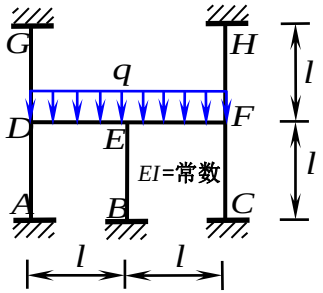
$k_{11}=10i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=-6i/l$

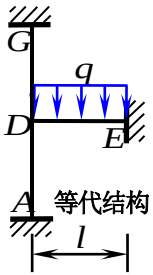
$F_{1P}=ql^2/8$　$F_{2P}=0$　$10iZ_1-6i/l\,Z_2+ql^2/8=0$

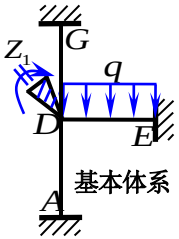
$-6i/l\,Z_1+12i/l^2\,Z_2=0$

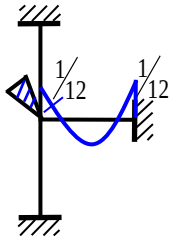
$Z_1=\dfrac{-ql^2}{56i}$　$Z_2=\dfrac{-ql^3}{112i}$　$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

【例题47】用位移法作弯矩图。（对称4-5）

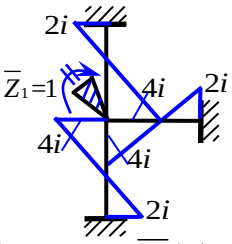




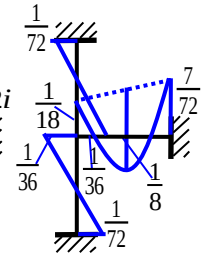




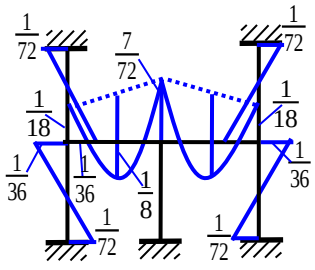
M_P图$\times ql^2$



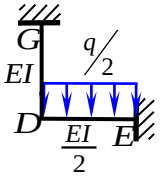
$\overline{M}_1$图



M图$\times ql^2$



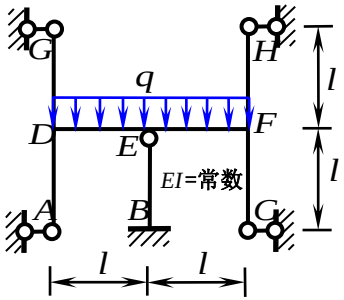
M图$\times ql^2$

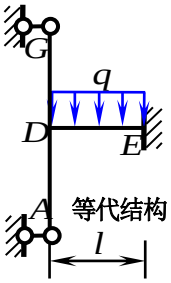


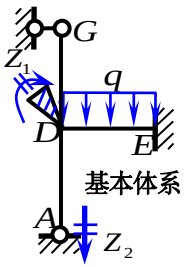
等代结构

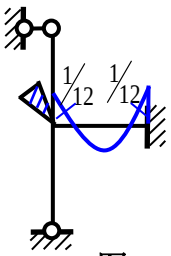
$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=12i$　$F_{1P}=-ql^2/12$　$Z_1=ql^2/144i$　$M=\overline{M}_1Z_1+M_P$

【例题48】用位移法作弯矩图。（对称4-6）

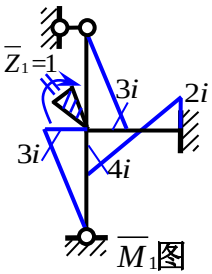




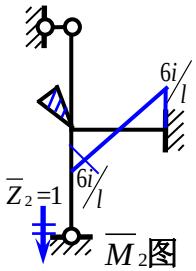




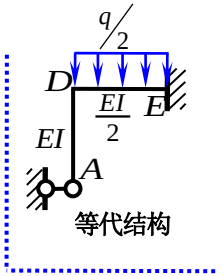
M_P图$\times ql^2$



$\overline{M}_1$图



$\overline{M}_2$图



等代结构

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

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

令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=12i/l^2$　$k_{21}=k_{12}=6i/l$

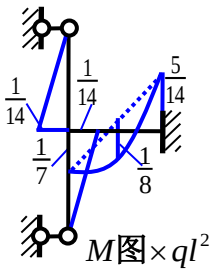
$F_{1P}=-ql^2/12$　$F_{1P}=-ql^2/12$

$10iZ_1+6i/l\,Z_2-ql^2/12=0$

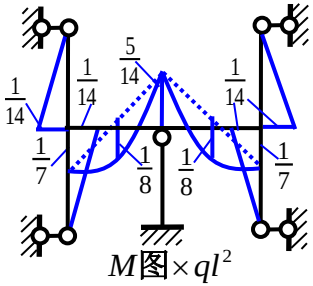
$6i/l\,Z_1+12i/l^2\,Z_2-ql/2=0$

$Z_1=\dfrac{-ql^2}{42i}$　$Z_2=\dfrac{3ql^3}{56i}$

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

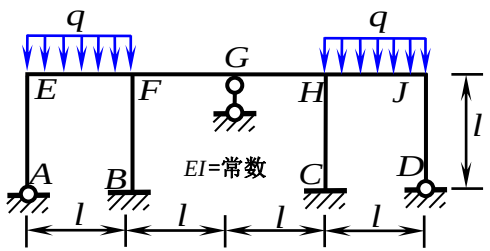


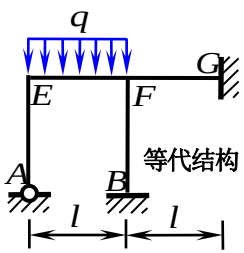
M图$\times ql^2$

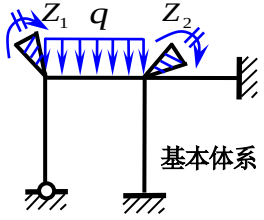


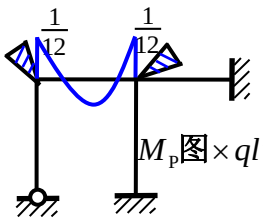
M图$\times ql^2$

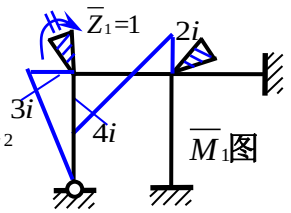
【例题49】用位移法作弯矩图。（对称4-11）

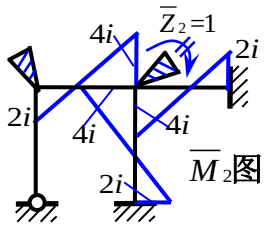








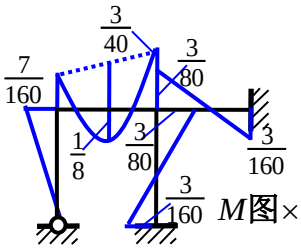


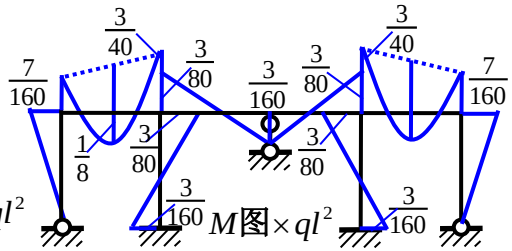


$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

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

$$k_{21}=k_{12}=2i$$





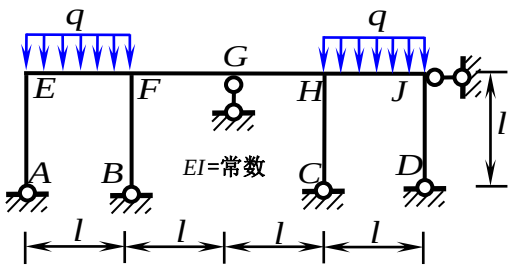
$F_{1P}=-ql^2/12$　$F_{2P}=ql^2/12$

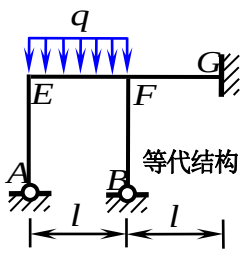
$7iZ_1+2iZ_2-ql^2/12=0$　$Z_1=\dfrac{7ql^2}{480i}$　$Z_2=\dfrac{-3ql^2}{320i}$

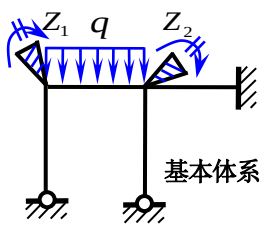
$2iZ_1+12iZ_2+ql^2/12=0$

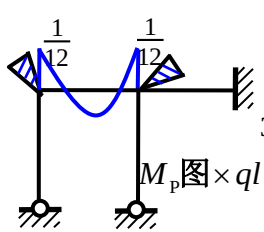
$M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$

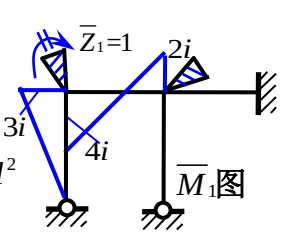
【例题50】用位移法作弯矩图。（对称4-18）

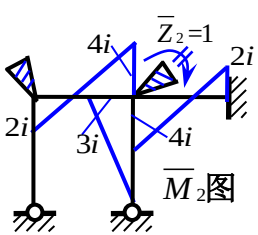






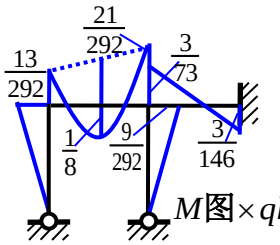


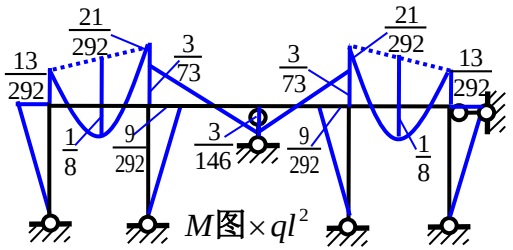




$$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$$
$$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$$

令线刚度：$i=EI/l$





$k_{11}=7i$　$k_{22}=11i$　$k_{21}=k_{12}=2i$　$F_{1P}=-ql^2/12$　$F_{2P}=ql^2/12$

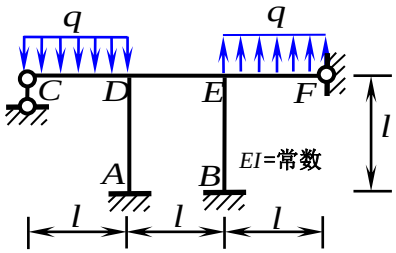
$7iZ_1+2iZ_2-ql^2/12=0$

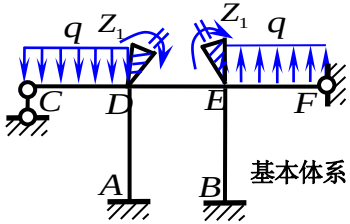
$2iZ_1+11iZ_2+ql^2/12=0$

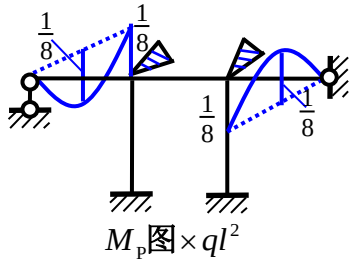
$Z_1=\dfrac{13ql^2}{876i}$　$Z_2=\dfrac{-3ql^2}{292i}$

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

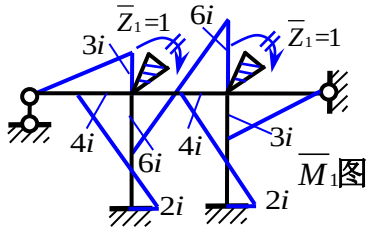
【例题51】用位移法作弯矩图。（对称4-19）







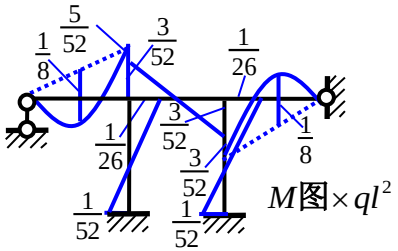
M_P图$\times ql^2$



$\overline{M}_1$图

$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=13i$　$F_{1P}=ql^2/8$　$Z_1=-ql^2/104i$

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

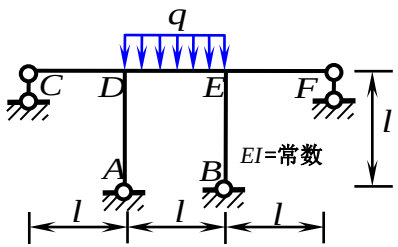


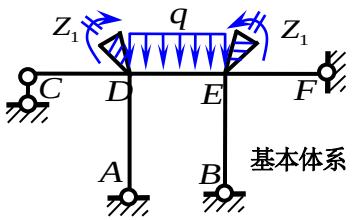
M图$\times ql^2$

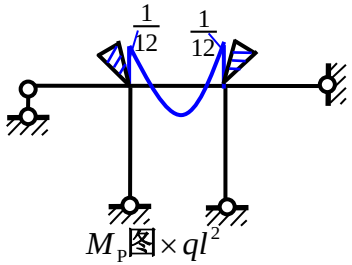
不计轴向变形时，可以当作对称结构，反对称荷载作用，
D、E结点转角位移反对称。由D结点刚臂反力得到位移法典型方程

由基本体系E、D结点刚臂反力为零得到的位移法典型方程是相同的。

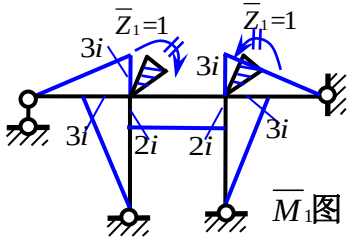
【例题52】用位移法作弯矩图。（对称4-29）





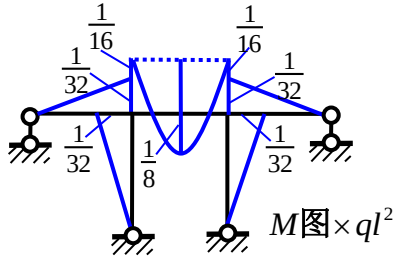


M_P图$\times ql^2$



$\overline{M}_1$图

$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=8i$　$F_{1P}=-ql^2/12$　$Z_1=ql^2/96i$　$M=\overline{M}_1Z_1+M_P$

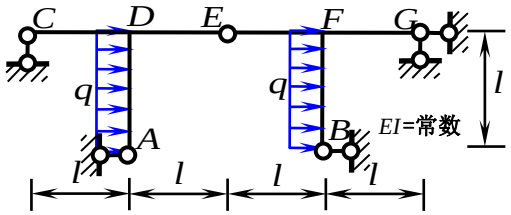


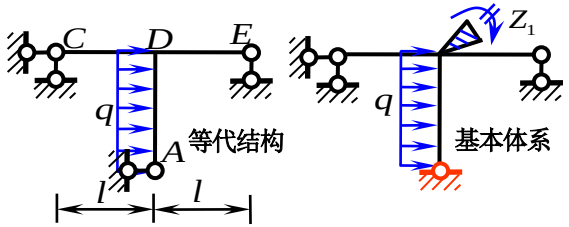
M图$\times ql^2$

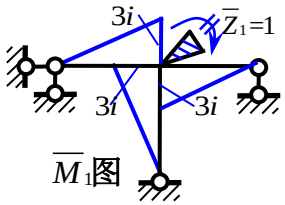
对称结构，对称荷载作用，D、E结点转角位移对称，F点水平位移等于零，线位移为零加链杆支座。由D结点刚臂反力得到位移法典型方程。

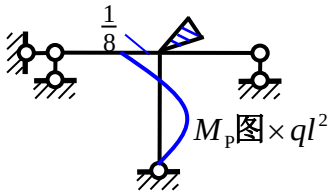
由基本体系E、D结点刚臂反力为零得到的位移法典型方程是相同的。

【例题53】用位移法作弯矩图。（对称4-33）



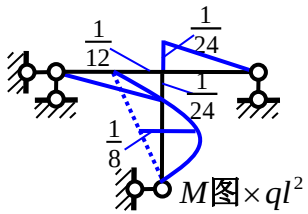


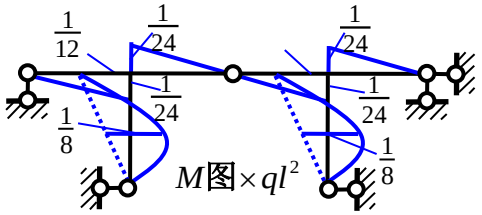




$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=9i$　$F_{1P}=ql^2/8$

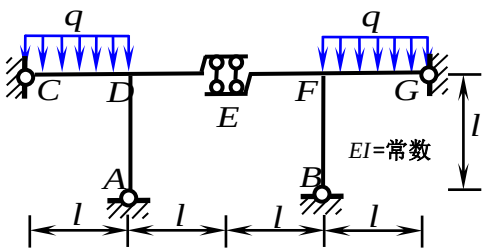
$Z_1=-ql^2/72i$　$M=\overline{M}_1Z_1+M_P$

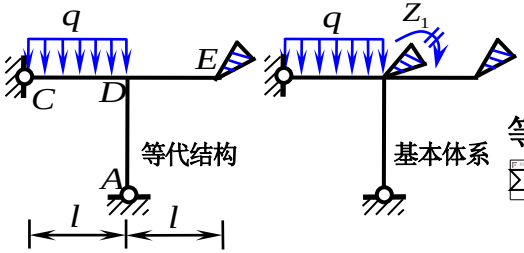


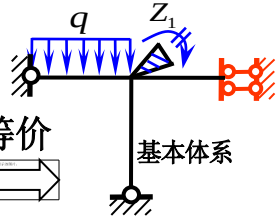


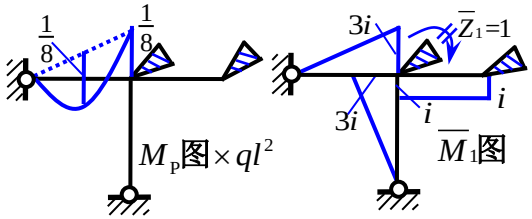
不计轴向变形，原结构可以当作对称结构计算，等代结构仍可以当作对称结构，
在反对称荷载作用下，**A**结点竖向位移为零，线位移为零加链杆支座，**A**链杆支座变成固定铰支座。

【例题54】用位移法作弯矩图。（对称4-37）



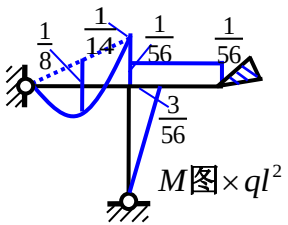


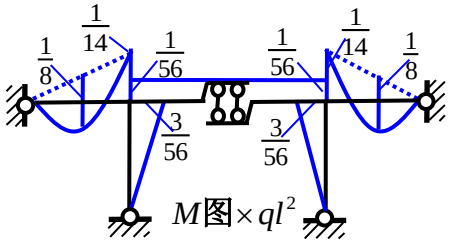




$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=7i$　$F_{1P}=ql^2/8$

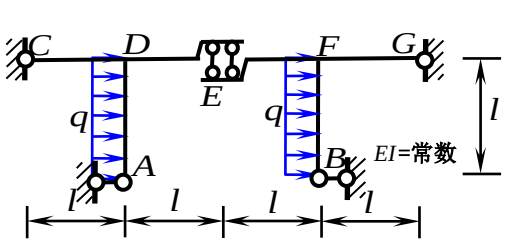
$Z_1=-ql^2/56i$　$M=\overline{M}_1Z_1+M_P$

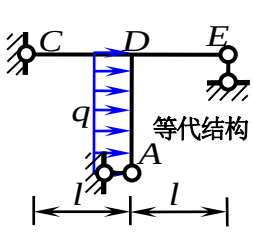


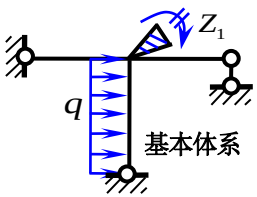


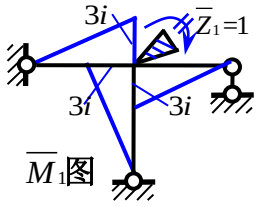
等代结构**E**处刚臂支座水平位移等于零，**E**处等价为定向支座

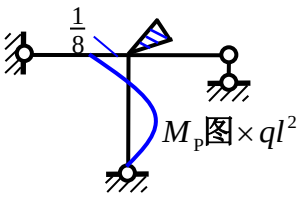
【例题55】用位移法作弯矩图。（对称4-39）





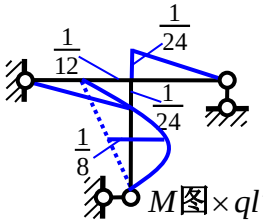


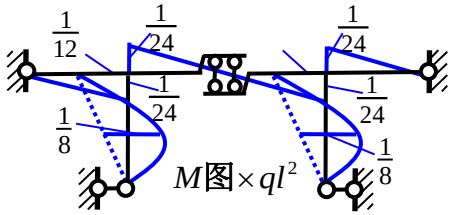




$k_{11}Z_1+F_{1P}=0$　令线刚度：$i=EI/l$　$k_{11}=9i$　$F_{1P}=ql^2/8$

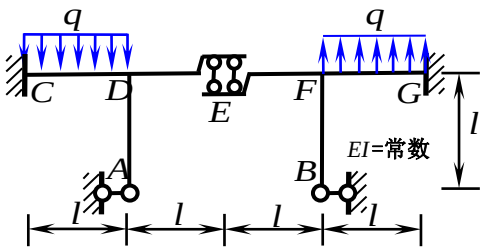
$Z_1=-ql^2/72i$　$M=\overline{M}_1Z_1+M_P$

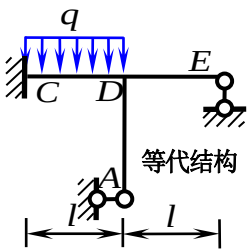


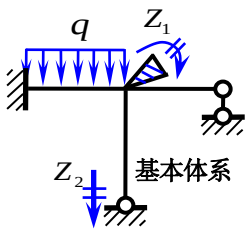


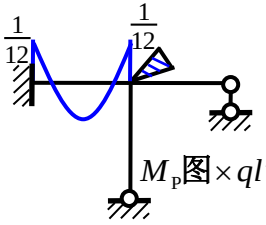
不计轴向变形，等代结构仍为对称结构，在反对称荷载作用下，**A**结点竖向位移为零，线位移为零加链杆支座，**A**链杆支座变成固定铰支座。

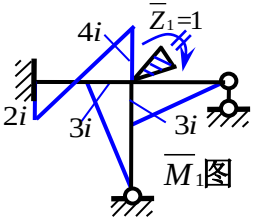
【例题56】用位移法作弯矩图。（对称4-40）

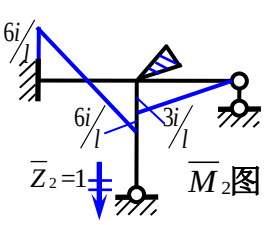












$k_{11}Z_1+k_{12}Z_2+F_{1P}=0$

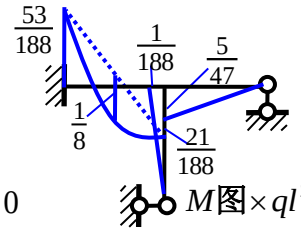
$k_{21}Z_1+k_{22}Z_2+F_{2P}=0$

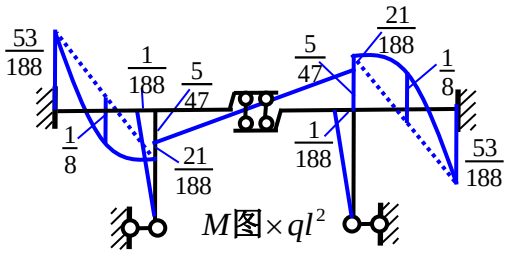
令线刚度：$i=EI/l$　$k_{11}=10i$　$k_{22}=15i/l^2$

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

$10iZ_1-3i/l\,Z_2+ql^2/12=0$

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





$$Z_1=\frac{ql^2}{564i}\qquad Z_2=\frac{19ql^3}{564i}\qquad M=\overline{M}_1Z_1+\overline{M}_2Z_2+M_P$$