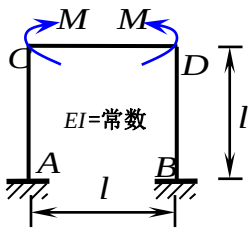
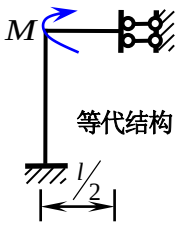
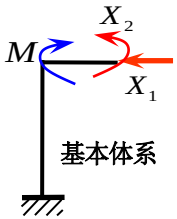
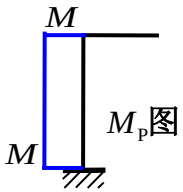
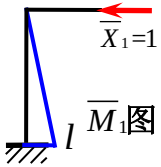
【例题1】用力法作弯矩图。（对称1-2）

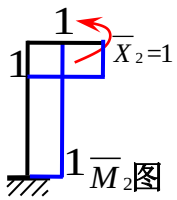


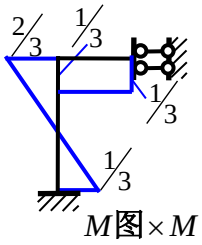


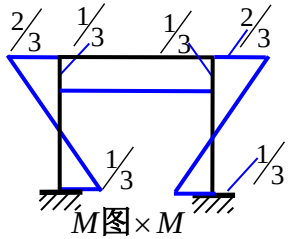












$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

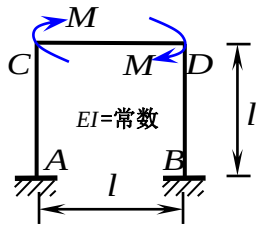
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l^3}{3EI}\qquad \delta_{12}=\delta_{21}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l^2}{2EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{3l}{2EI}$$

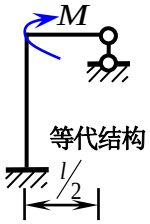
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml^2}{2EI}\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}ds=\frac{-Ml}{EI}$$

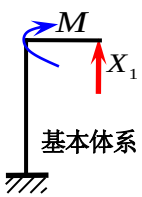
$$\frac{l^3}{3EI}X_1+\frac{l^2}{2EI}X_2-\frac{Ml^2}{2EI}=0$$
$$\frac{l^2}{2EI}X_1+\frac{3l}{2EI}X_2-\frac{Ml}{EI}=0$$

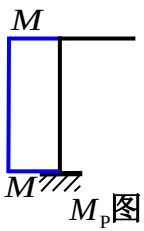
$$X_1=M/l\qquad X_2=M/3\qquad M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

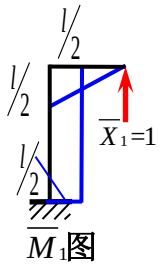
【例题2】用力法作弯矩图。（对称1-3）

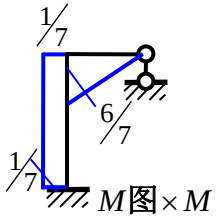


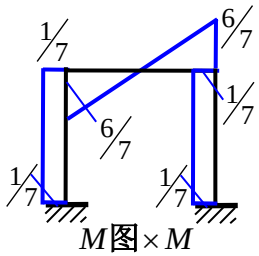










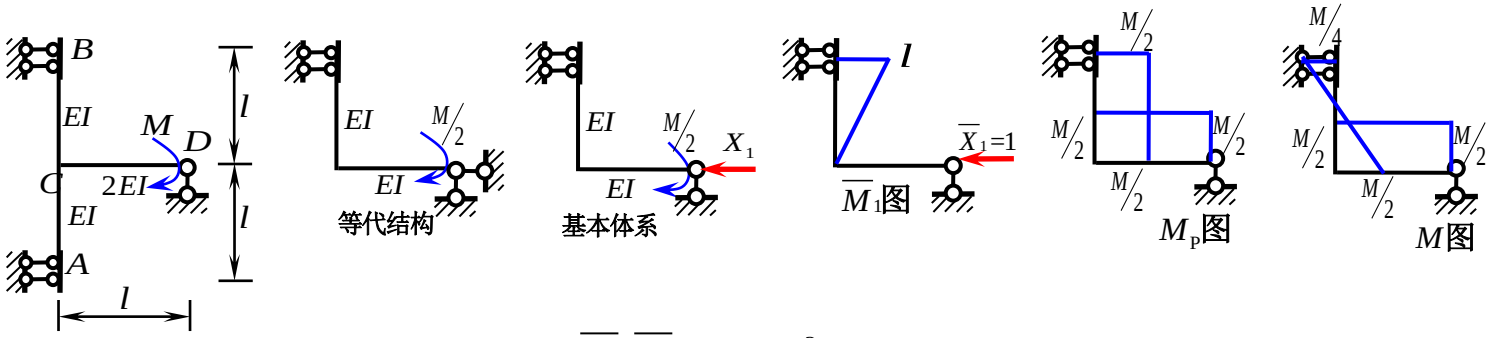


$$\delta_{11}X_1+\Delta_{1P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{7l^3}{24EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml^2}{2EI}$$

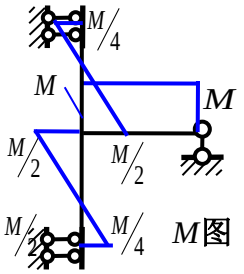
$$X_1=-\Delta_{1P}/\delta_{11}=12M/7l\qquad M=X_1\overline{M}_1+M_P$$

【例题3】用力法作弯矩图。（对称2-3）

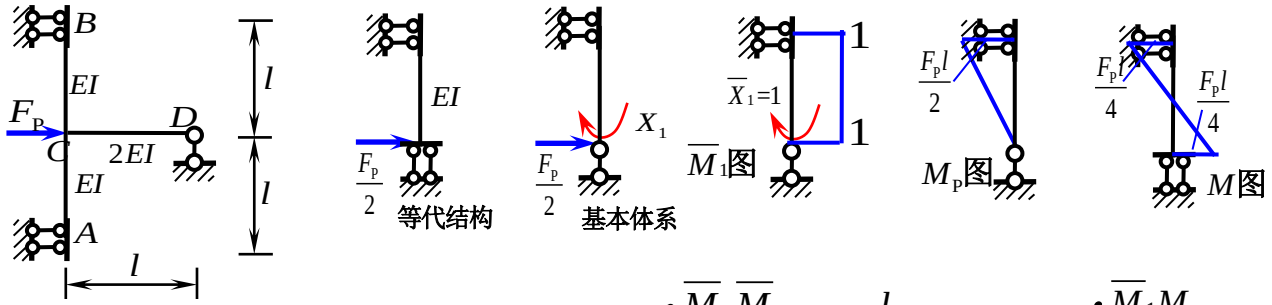


$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l^3}{3EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{Ml^2}{4EI}$$

$$X_1=-\Delta_{1P}/\delta_{11}=-3M/4l \qquad M=X_1\overline{M}_1+M_P$$

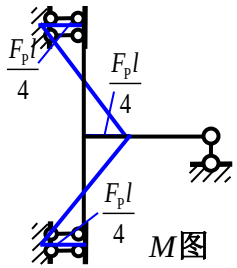


【例题4】用力法作弯矩图。（对称2-4）

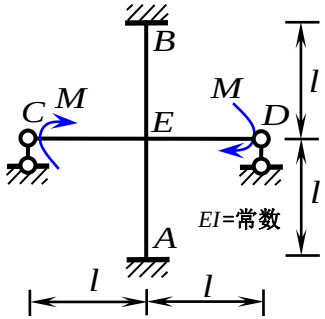


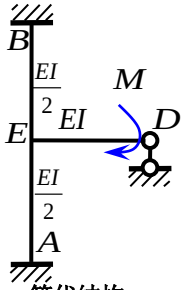
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_Pl^2}{4EI}$$

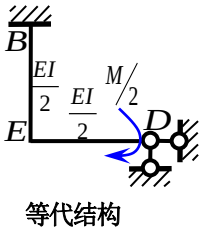
$$X_1=-\Delta_{1P}/\delta_{11}=F_Pl/4 \qquad M=X_1\overline{M}_1+M_P$$

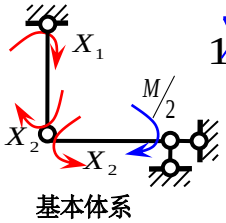


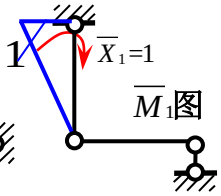
【例题5】用力法作弯矩图。（对称2-11）

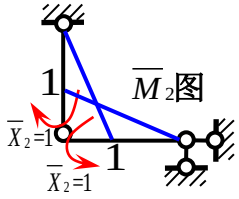


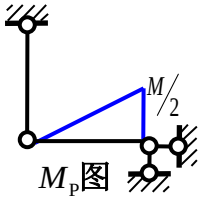


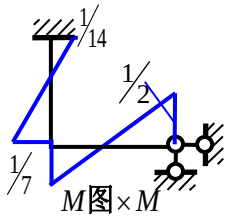


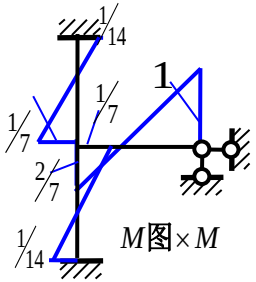


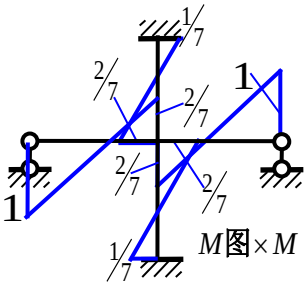












$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

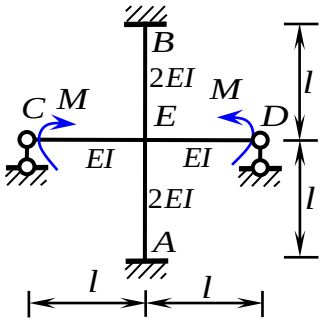
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-l}{3EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l}{3EI}$$

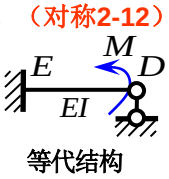
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=0\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{Ml}{6EI}$$

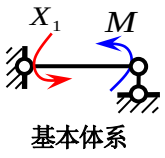
$$\frac{2l}{3EI}X_1-\frac{l}{3EI}X_2=0$$
$$\frac{-l}{3EI}X_1+\frac{4l}{3EI}X_2+\frac{Ml}{6EI}=0$$

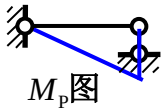
$$X_1=-M/14\qquad X_2=-M/7$$
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

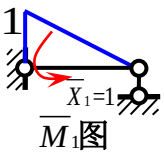
【例题6】用力法作弯矩图。（对称2-12）

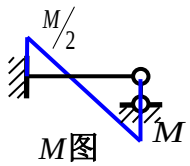


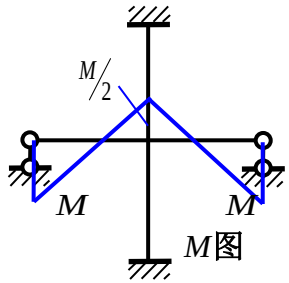








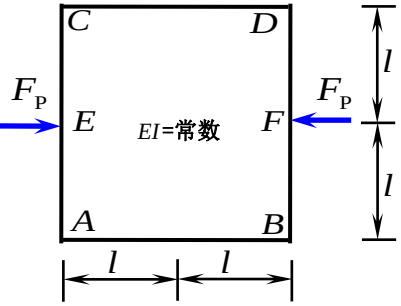


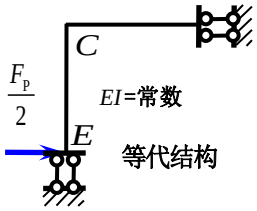


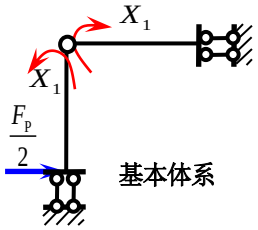
$$\delta_{11}X_1+\Delta_{1P}=0\qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}$$

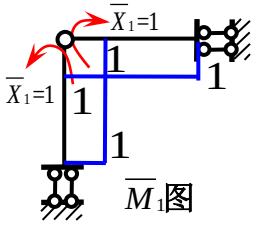
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml}{6EI}\qquad X_1=\frac{-\Delta_{1P}}{\delta_{11}}=M/2\qquad M=X_1\overline{M}_1+M_P$$

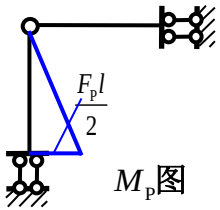
【例题7】用力法作弯矩图。（对称2-22）

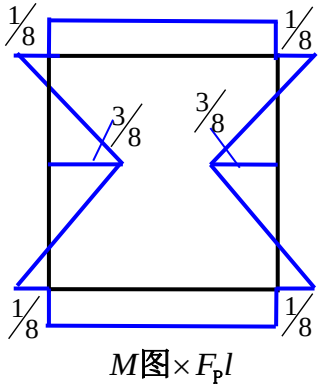








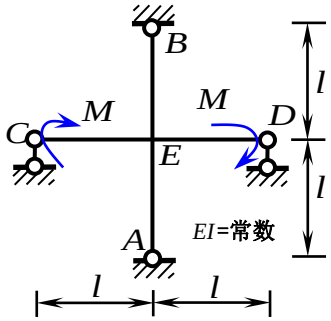


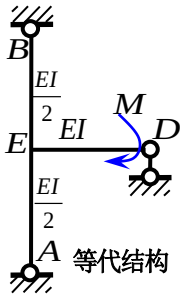


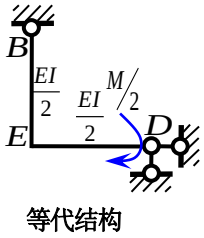
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{EI}$$

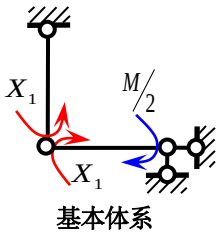
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{F_P l^2}{4EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=-F_P l/8 \qquad M=X_1\overline{M}_1+M_P$$

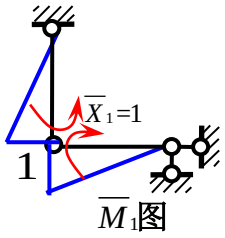
【例题8】用力法作弯矩图。（对称2-25）

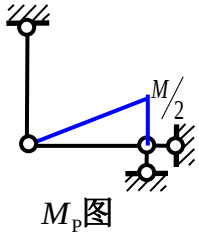






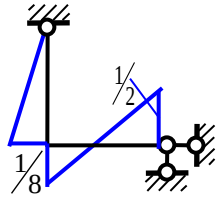


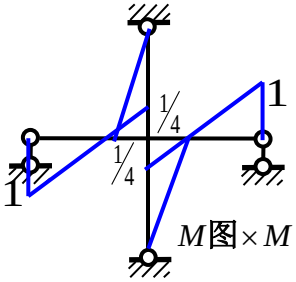




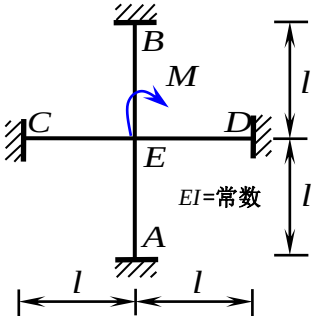
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}$$

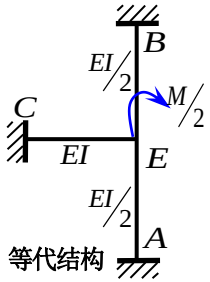
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml}{6EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=M/8 \qquad M=X_1\overline{M}_1+M_P$$

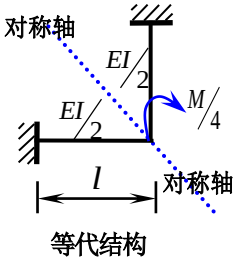


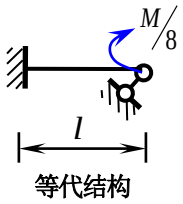


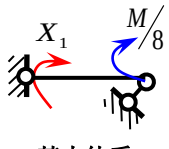
【例题9】用力法作弯矩图。（对称2-32）

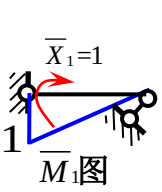


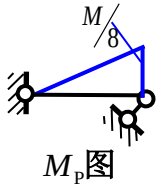






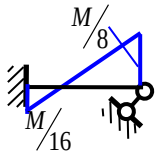


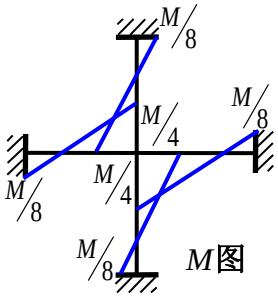




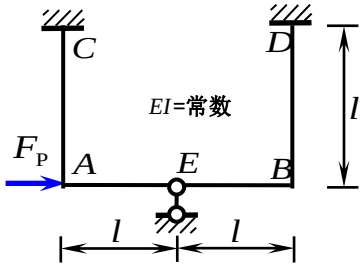
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{3EI}$$

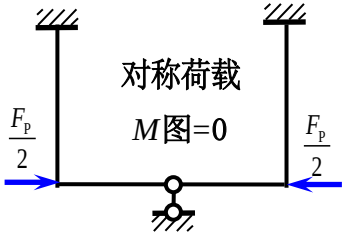
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml}{24EI} \qquad X_1=\frac{-\Delta_{1P}}{\delta_{11}}=\frac{M}{16} \qquad M=X_1\overline{M}_1+M_P$$

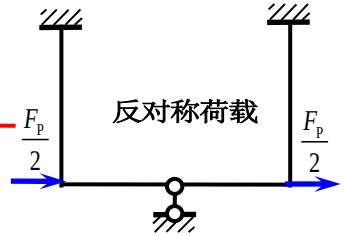


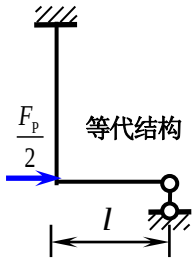


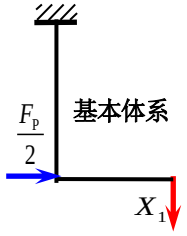
【例题10】用力法作弯矩图。（对称2-33）







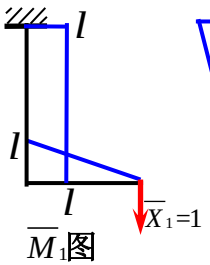


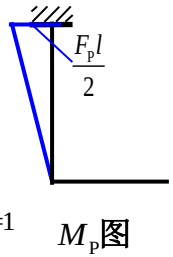


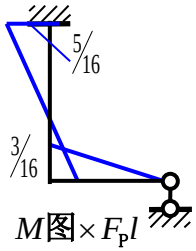
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}$$

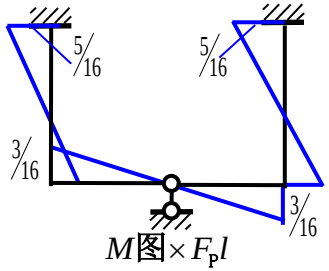
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_Pl^3}{4EI}$$

$$X_1=\frac{-\Delta_{1P}}{\delta_{11}}=\frac{3F_P}{16} \qquad M=X_1\overline{M}_1+M_P$$

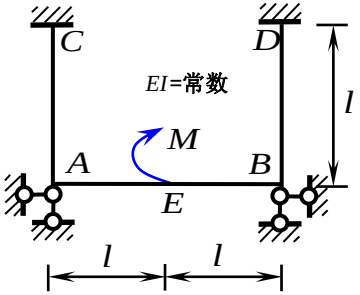


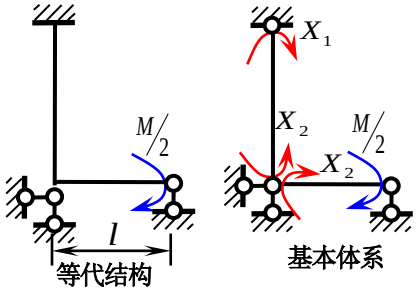


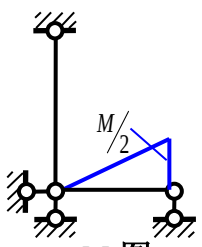


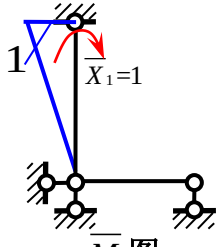


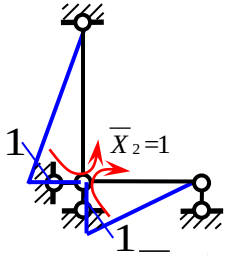
【例题11】用力法作弯矩图。（对称2-34）

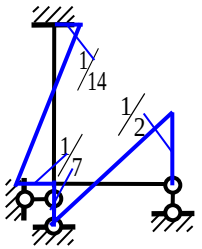












$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

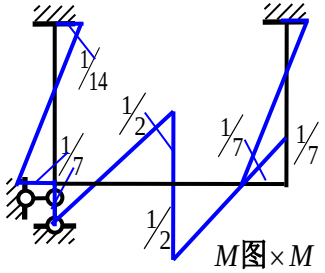
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l}{6EI}$$

$$\delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{2l}{3EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=0\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{-Ml}{12EI}$$

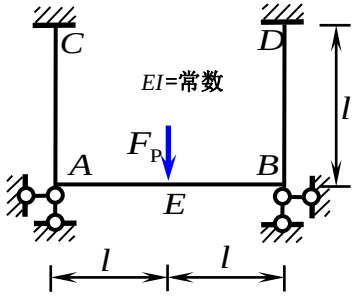
$$\frac{l}{3EI}X_1+\frac{l}{6EI}X_2=0$$

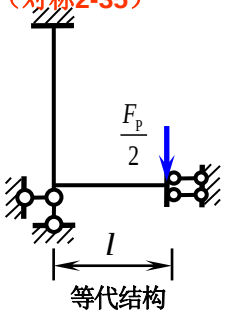
$$\frac{l}{6EI}X_1+\frac{2l}{3EI}X_2-\frac{Ml}{12EI}=0\qquad X_1=-M/14\qquad X_2=M/7$$

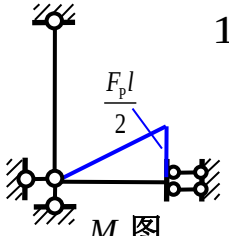
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

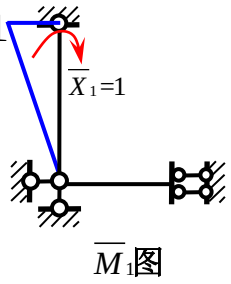


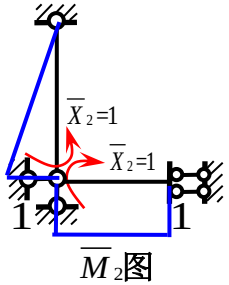
【例题12】用力法作弯矩图。（对称2-35）

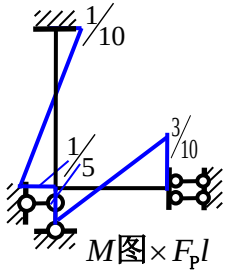












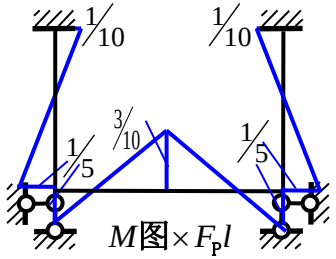
$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l}{6EI}$$

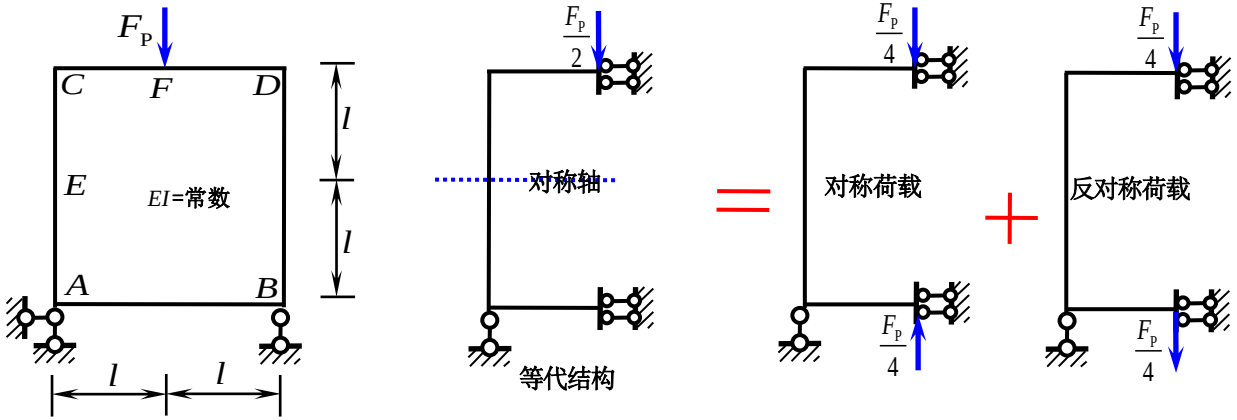
$$\delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l}{3EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l}{3EI}\qquad \frac{l}{3EI}X_1+\frac{l}{6EI}X_2=0$$

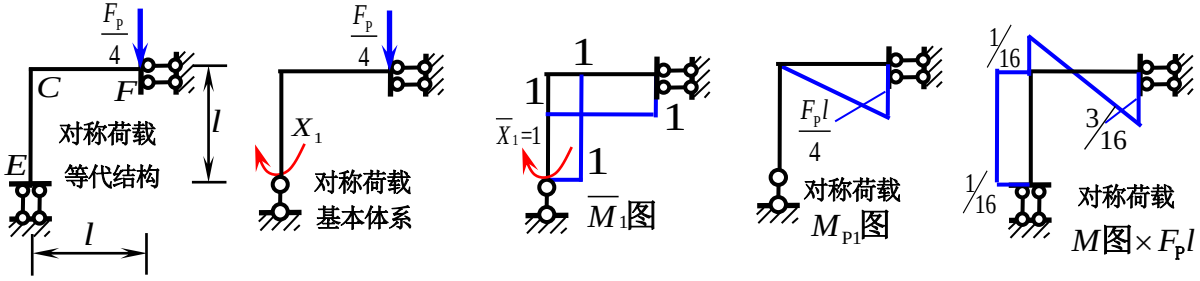
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=0\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=\frac{-F_Pl^2}{4EI}\qquad \frac{l}{6EI}X_1+\frac{4l}{3EI}X_2-\frac{F_Pl^2}{4EI}=0\qquad X_1=-F_Pl/10\qquad X_2=F_Pl/5$$

$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$



【例题13】用力法作弯矩图。（对称2-38）





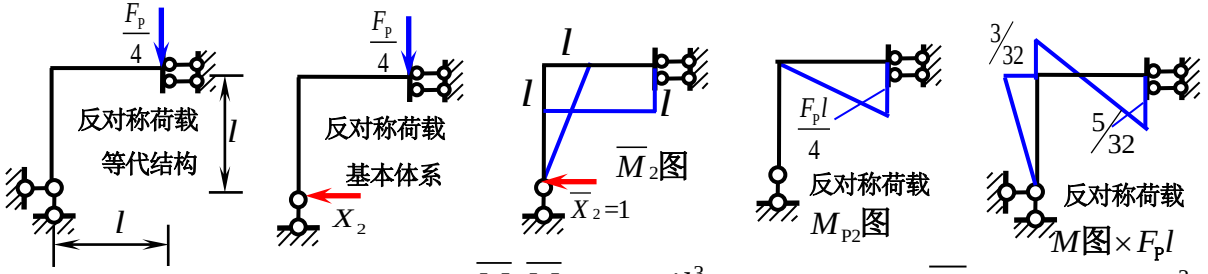
$$\delta_{11}X_1+\Delta_{1P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{EI}$$

$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_{P1}}{EI}ds=\frac{F_Pl^2}{8EI}$$

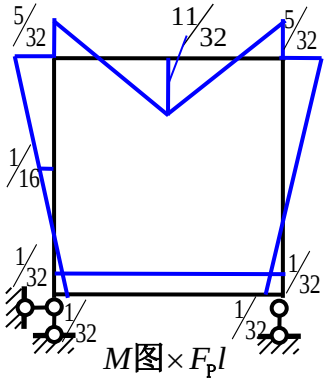
$$X_1=-\Delta_{1P}/\delta_{11}=-F_Pl/16$$

$$M_{对}=X_1\overline{M}_1+M_P$$



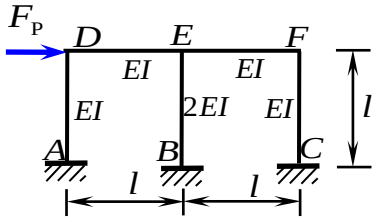
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_{P1}}{EI}ds=\frac{F_Pl^3}{8EI}$$

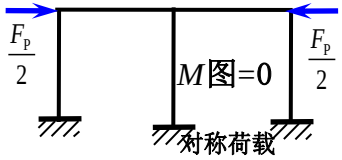
$$X_1=-\Delta_{1P}/\delta_{11}=-3F_P/32 \qquad M_{反}=X_1\overline{M}_1+M_P$$

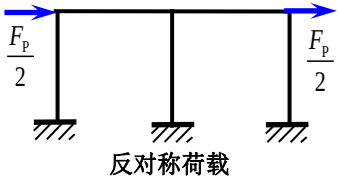


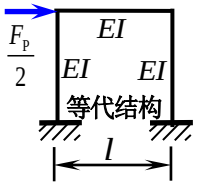
$$M=M_{对}+M_{反}$$

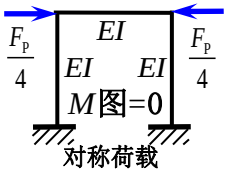
【例题14】用力法作弯矩图。（对称3-4）

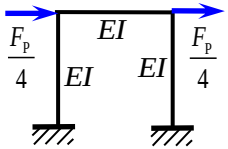


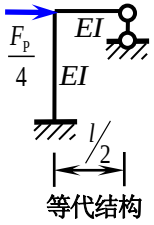


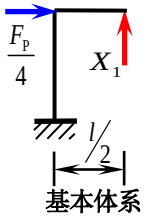


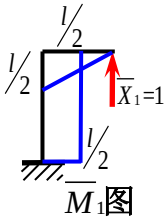


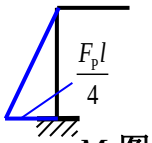


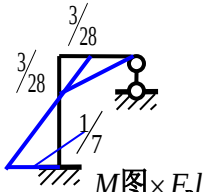










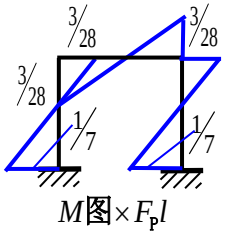


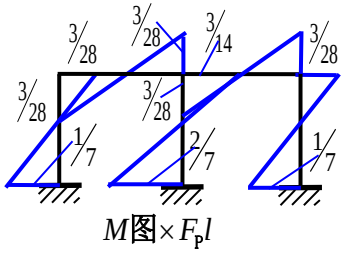
$$\delta_{11}X_1+\Delta_{1P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{7l^3}{24EI}$$

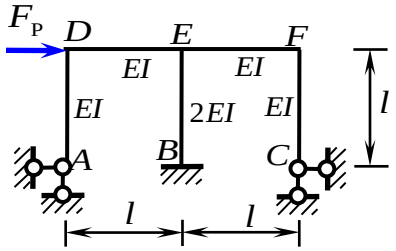
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_Pl^3}{16EI}$$

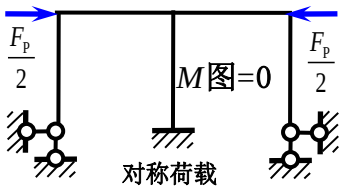
$$X_1=-\Delta_{1P}/\delta_{11}=3F_P/14 \qquad M=X_1\overline{M}_1+M_P$$

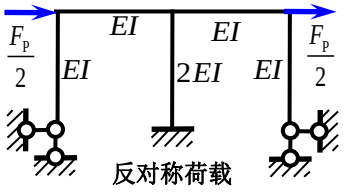


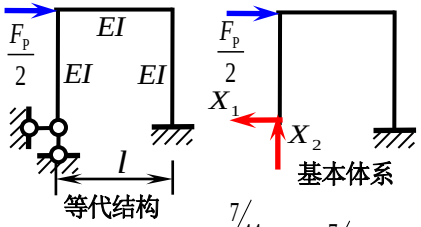


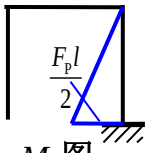
【例题15】用力法作弯矩图。（对称3-5）

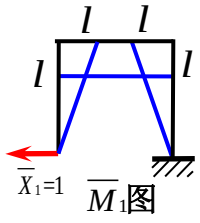


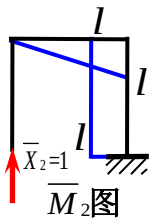


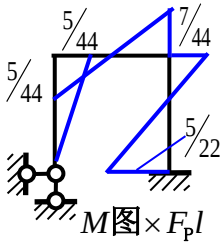


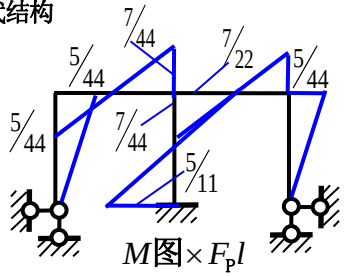












$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

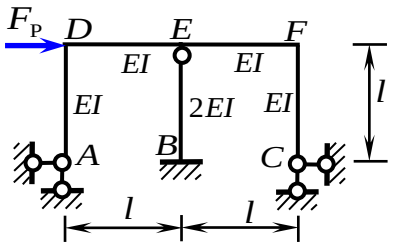
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{5l^3}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l^3}{EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l^3}{3EI}$$

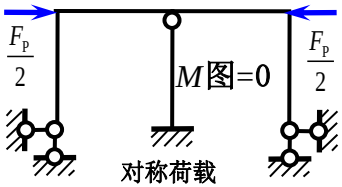
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=\frac{F_P l^3}{12EI}\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{F_P l^3}{4EI}$$

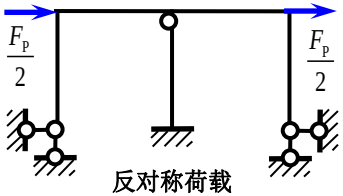
$$\frac{5l^3}{3EI}X_1+\frac{l^3}{EI}X_2+\frac{F_P l^3}{12EI}=0\qquad X_1=5F_P/44$$
$$\frac{l^3}{EI}X_1+\frac{4l^3}{3EI}X_2+\frac{F_P l^3}{4EI}=0\qquad X_2=-3F_P/11$$

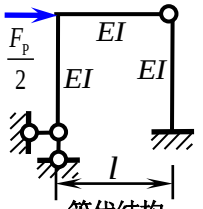
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

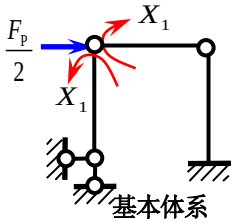
【例题16】用力法作弯矩图。（对称3-8）

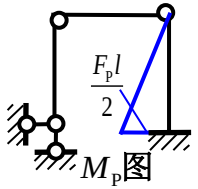


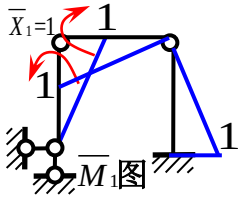


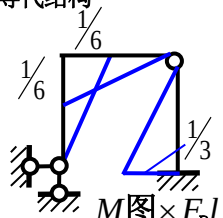


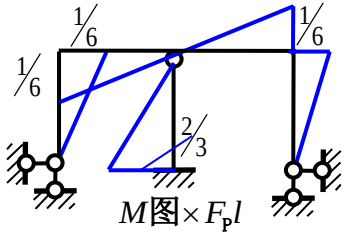










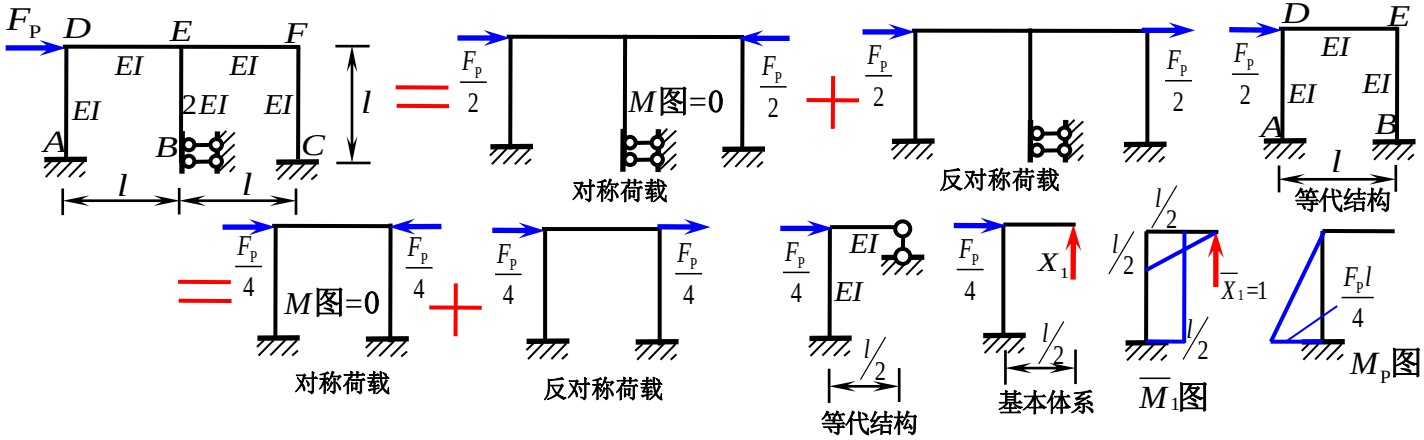


$$\delta_{11}X_1+\Delta_{1P}=0\qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{EI}$$

$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_P l^2}{6EI}\qquad X_1=-\Delta_{1P}/\delta_{11}=F_P l/6$$

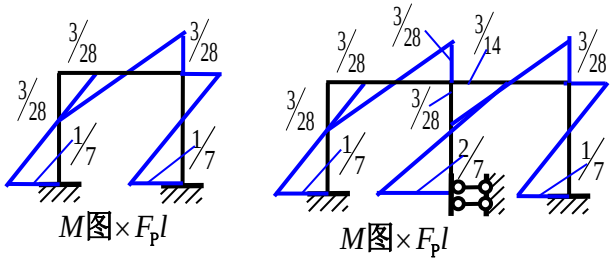
$$M=X_1\overline{M}_1+M_P$$

【例题17】用力法作弯矩图。（对称3-9）

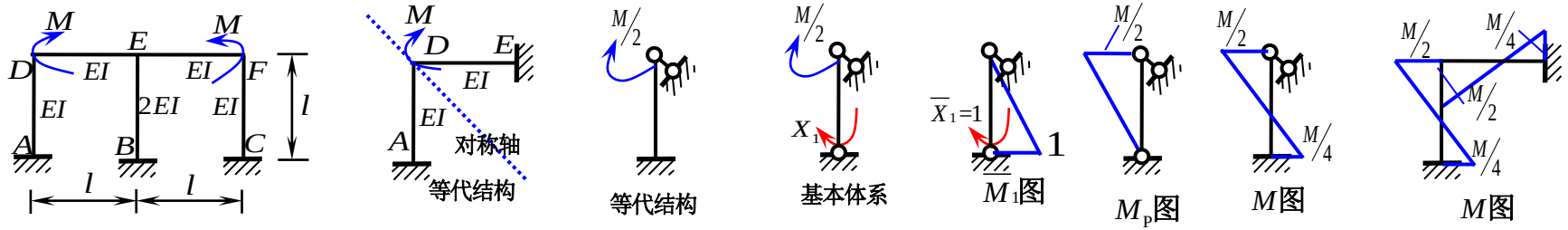


$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{7l^3}{24EI}$$

$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_Pl^3}{16EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=3F_P/14 \qquad M=X_1\overline{M}_1+M_P$$

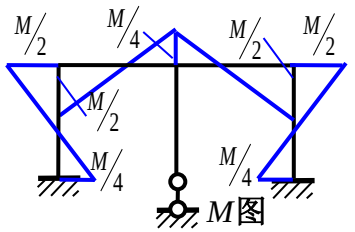


【例题18】用力法作弯矩图。（对称3-20）

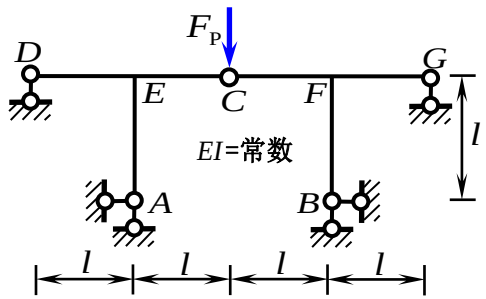


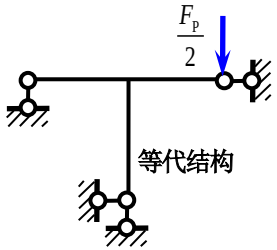
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-Ml}{12EI}$$

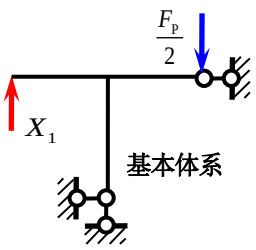
$$X_1=-\Delta_{1P}/\delta_{11}=M/4 \qquad M=X_1\overline{M}_1+M_P$$

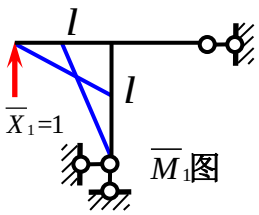


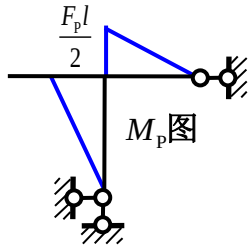
【例题19】用力法作弯矩图。（对称6-25）







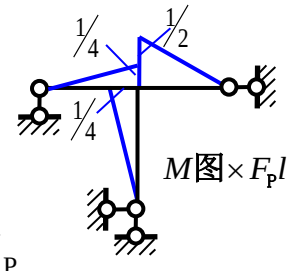


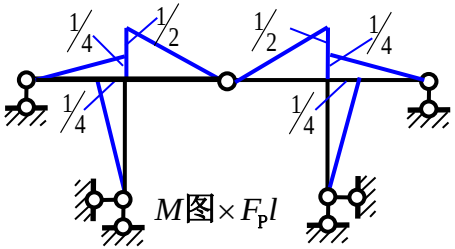


$$\delta_{11}X_1+\Delta_{1P}=0 \quad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l^3}{3EI}$$

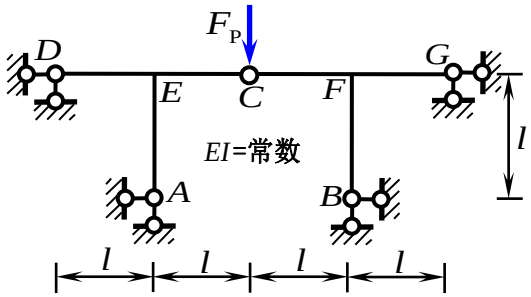
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{F_Pl^3}{6EI} \quad X_1=-\Delta_{1P}/\delta_{11}=-F_P/4$$

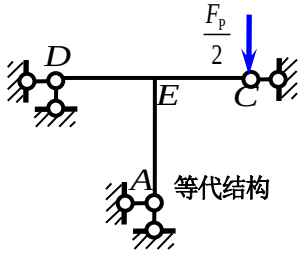
$$M=X_1\overline{M}_1+M_P$$

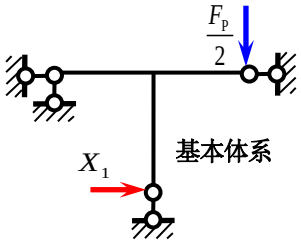


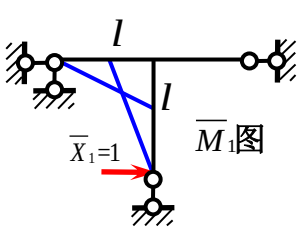


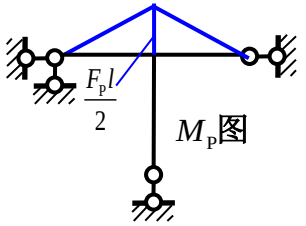
【例题20】用力法作弯矩图。（对称6-33）







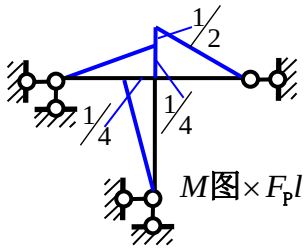


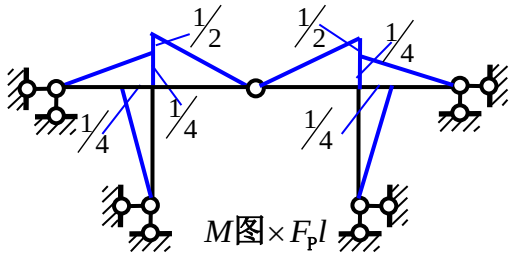


$$\delta_{11}X_1+\Delta_{1P}=0 \quad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l^3}{3EI}$$

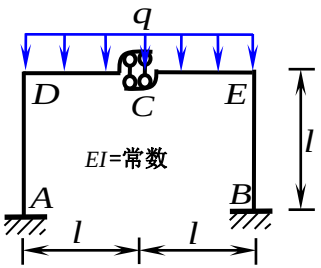
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-F_Pl^3}{6EI} \quad X_1=-\Delta_{1P}/\delta_{11}=F_P/4$$

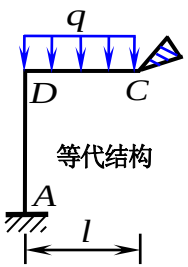
$$M=X_1\overline{M}_1+M_P$$

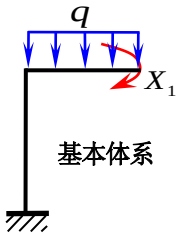


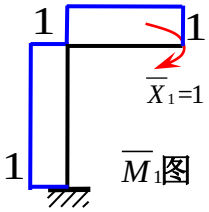


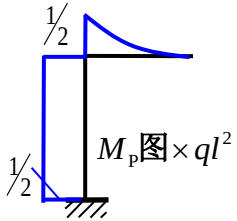
【例题21】用力法作弯矩图。（对称7-11）

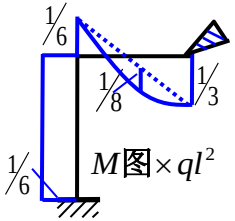


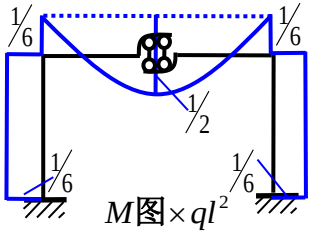








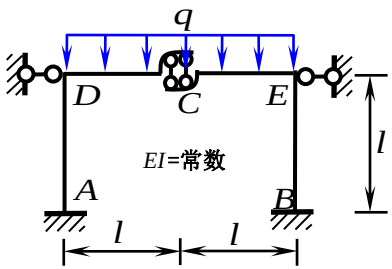


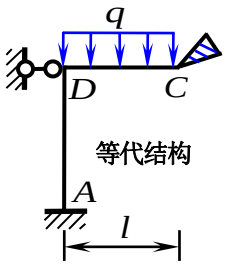


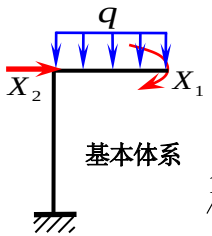
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{2ql^3}{3EI}$$

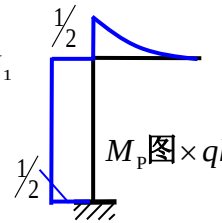
$$X_1=-\Delta_{1P}/\delta_{11}=-ql^2/3 \qquad M=X_1\overline{M}_1+M_P$$

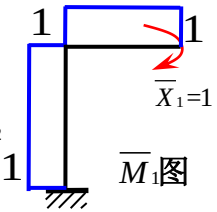
【例题22】用力法作弯矩图。（对称7-12）

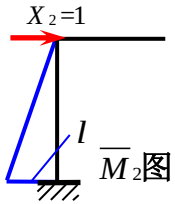


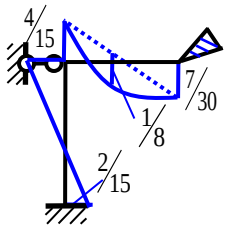


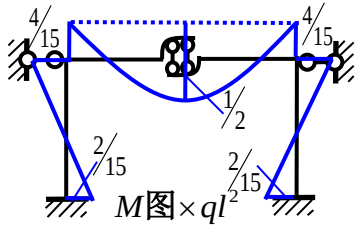












$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

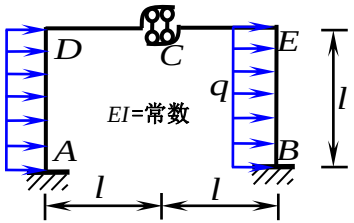
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{EI} \qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{l^3}{3EI}$$

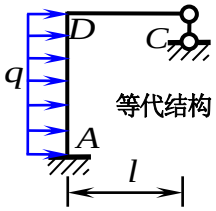
$$\delta_{12}=\delta_{21}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l^2}{2EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{2ql^3}{3EI} \qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}ds=\frac{ql^4}{4EI}$$

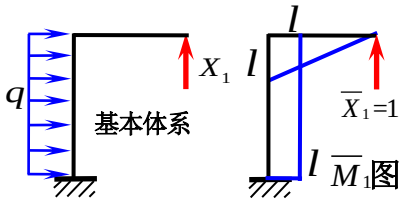
$$\frac{2l}{EI}X_1+\frac{l^2}{2EI}X_2+\frac{2ql^3}{3EI}=0$$
$$\frac{l^2}{2EI}X_1+\frac{l^3}{3EI}X_2+\frac{ql^4}{4EI}=0$$

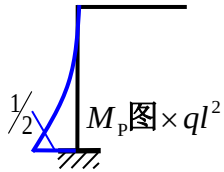
$$X_1=-7ql^2/30 \qquad X_2=-2ql/5 \qquad M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

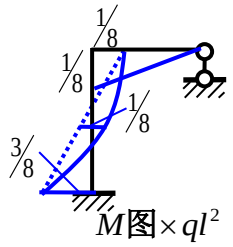
【例题23】用力法作弯矩图。（对称7-13）





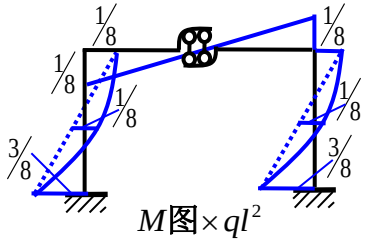




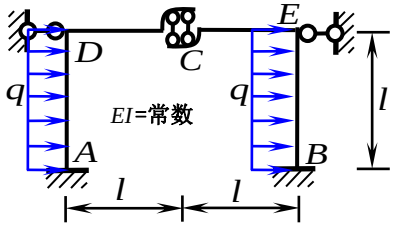


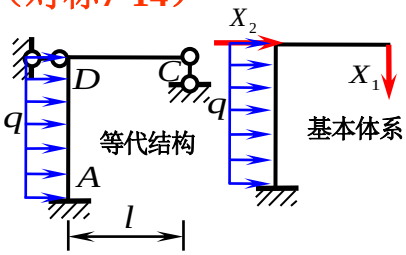
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l}{3EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-ql^4}{6EI}$$

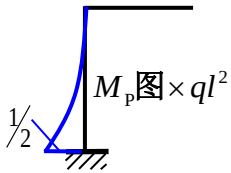
$$X_1=-\Delta_{1P}/\delta_{11}=ql/8 \qquad M=X_1\overline{M}_1+M_P$$

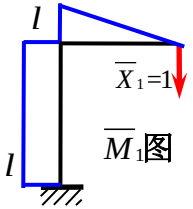


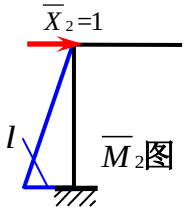
【例题24】用力法作弯矩图。（对称7-14）





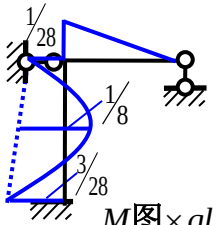


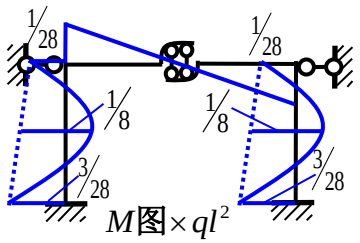




$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}$$





$$\delta_{12}=\delta_{21}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{l^3}{2EI} \qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{l^3}{3EI}$$

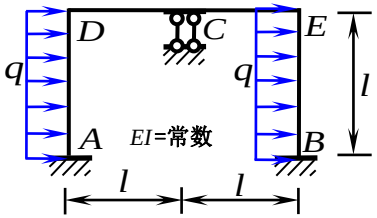
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{ql^4}{6EI} \qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}ds=\frac{ql^4}{8EI}$$

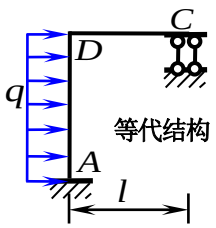
$$\frac{4l^3}{3EI}X_1+\frac{l^3}{2EI}X_2+\frac{ql^4}{6EI}=0$$
$$\frac{l^3}{2EI}X_1+\frac{l^3}{3EI}X_2+\frac{ql^4}{8EI}=0$$

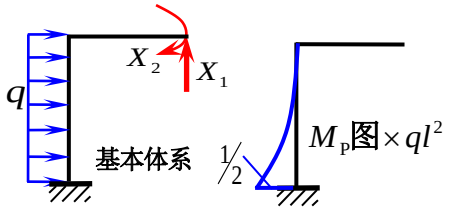
$$X_1=ql/28 \qquad X_2=-3ql/7$$

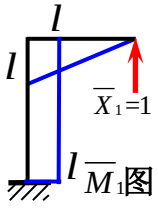
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

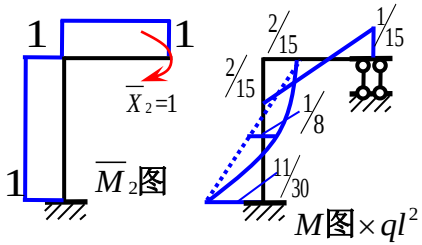
【例题25】用力法作弯矩图。（对称7-15）











$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

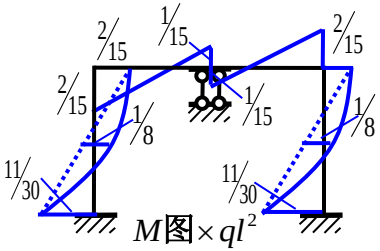
$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-3l^2}{2EI}$$

$$\delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{2l}{EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=\frac{-ql^4}{6EI}\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{ql^3}{6EI}$$

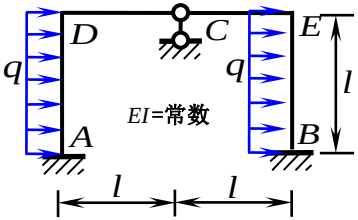
$$\frac{4l^3}{3EI}X_1-\frac{3l^2}{2EI}X_2-\frac{ql^4}{6EI}=0$$
$$-\frac{3l^2}{2EI}X_1+\frac{2l}{EI}X_2+\frac{ql^3}{6EI}=0$$

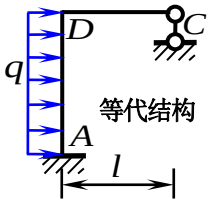
$$X_1=ql/5\qquad X_2=ql^2/15$$

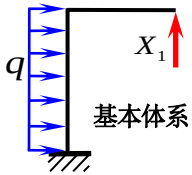
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

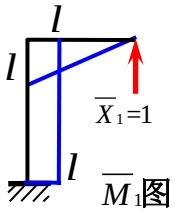


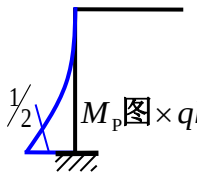
【例题26】用力法作弯矩图。（对称7-20）

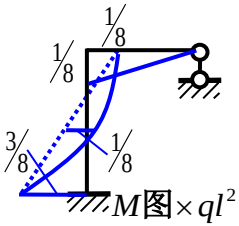






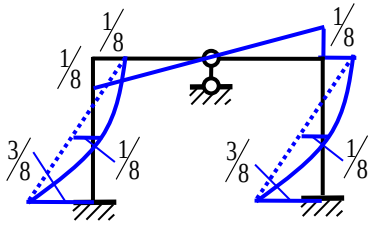




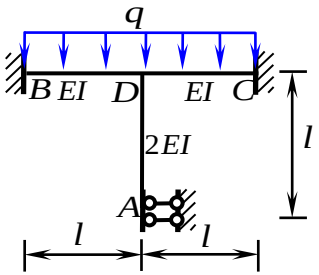


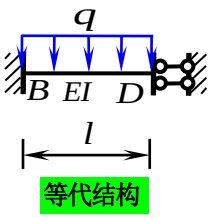
$$\delta_{11}X_1+\Delta_{1P}=0\qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=\frac{-ql^4}{6EI}$$

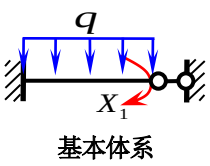
$$X_1=-\Delta_{1P}/\delta_{11}=ql/8\qquad M=X_1\overline{M}_1+M_P$$

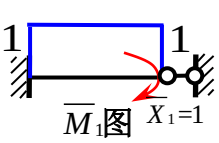


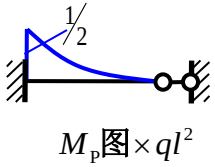
【例题27】用力法作弯矩图。（对称7-21）

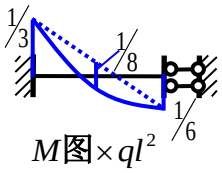


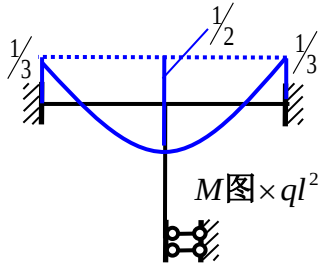








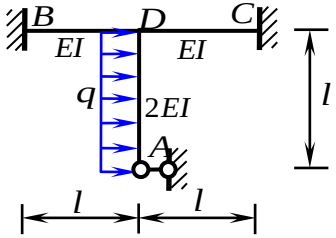


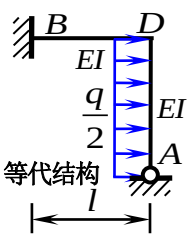


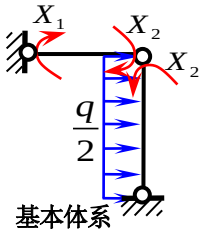
$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{EI}$$

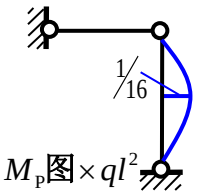
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{ql^3}{6EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=-ql^2/6 \qquad M=X_1\overline{M}_1+M_P$$

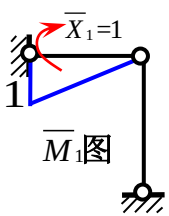
【例题28】用力法作弯矩图。（对称7-28）

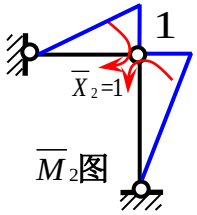


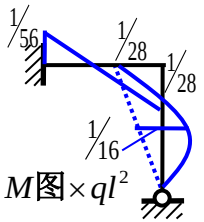




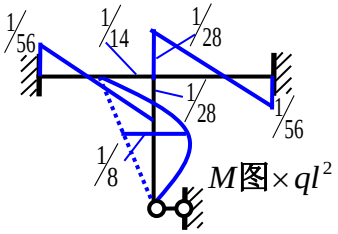








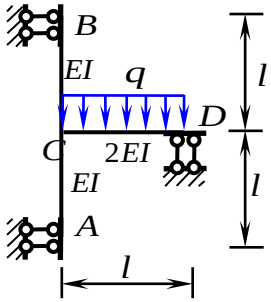
$$\begin{aligned}\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}&=0\\ \delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}&=0\end{aligned} \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI} \qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-l}{6EI}$$

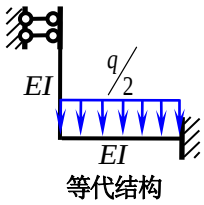


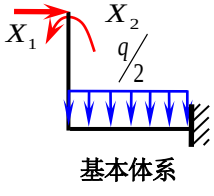
$$\delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{2l}{3EI} \qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=0 \qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{ql^3}{48EI}$$

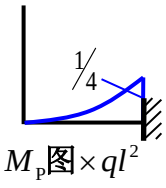
$$\begin{aligned}\frac{l}{3EI}X_1-\frac{l}{6EI}X_2&=0\\ \frac{-l}{6EI}X_1+\frac{2l}{3EI}X_2+\frac{ql^3}{48EI}&=0\end{aligned} \qquad X_1=-ql^2/56 \qquad X_2=-ql^2/28 \qquad M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

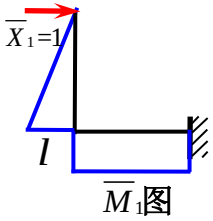
【例题29】用力法作弯矩图。（对称7-30）

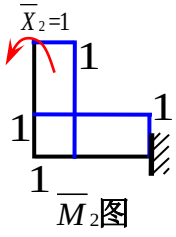


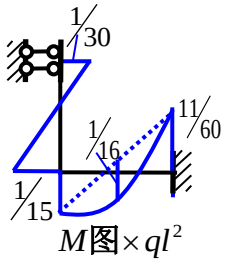








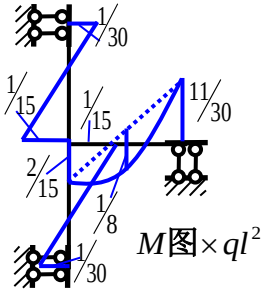




$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{4l^3}{3EI}\qquad \delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-3l^2}{2EI}$$

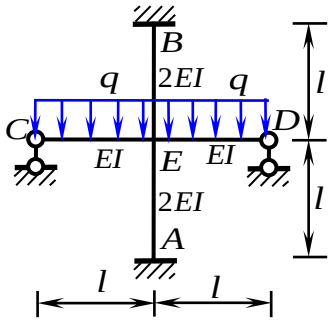
$$\delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{2l}{EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}dx=\frac{-ql^4}{12EI}\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{ql^3}{12EI}$$

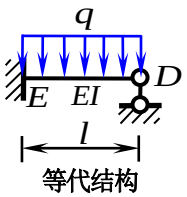


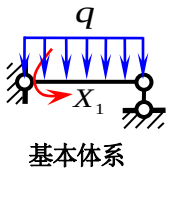
$$\frac{4l^3}{3EI}X_1-\frac{3l^2}{2EI}X_2-\frac{ql^4}{12EI}=0$$
$$\frac{-3l^2}{2EI}X_1+\frac{2l}{EI}X_2+\frac{ql^3}{12EI}=0$$

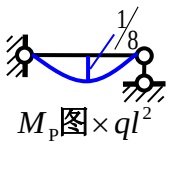
$$X_1=ql/10\qquad X_2=ql^2/30\qquad M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

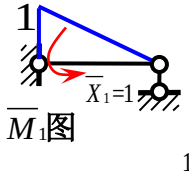
【例题30】用力法作弯矩图。（对称7-33）

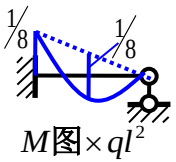


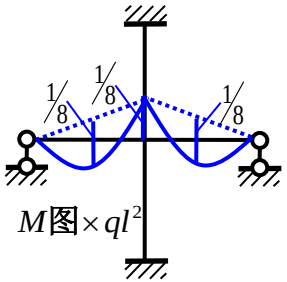








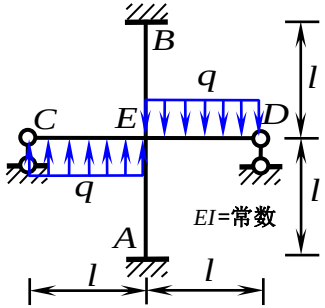


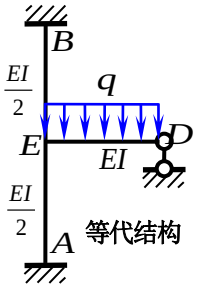


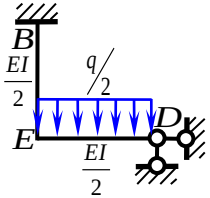
$$\delta_{11}X_1+\Delta_{1P}=0\qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-ql^3}{24EI}$$

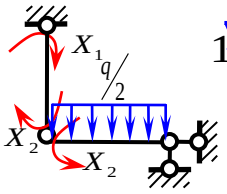
$$X_1=-\Delta_{1P}/\delta_{11}=ql^2/8\qquad M=X_1\overline{M}_1+M_P$$

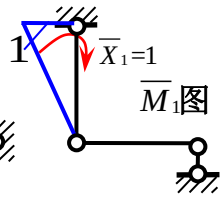
【例题31】用力法作弯矩图。（对称7-34）

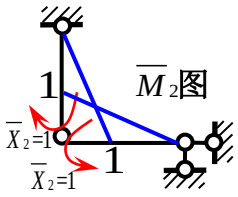


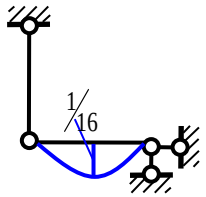








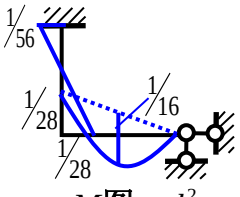


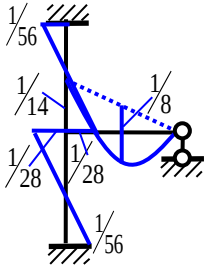


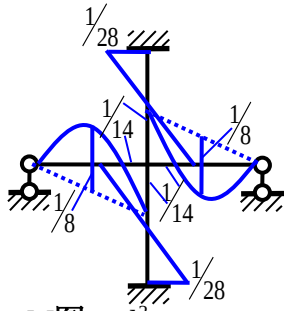
$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{3EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l}{3EI}$$

$$\delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-l}{3EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=0\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{-ql^3}{24EI}$$





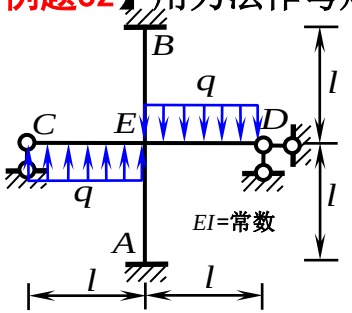


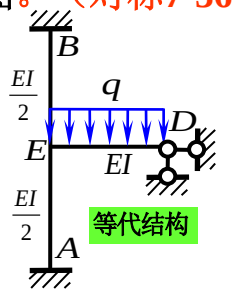
$$\frac{2l}{3EI}X_1-\frac{l}{3EI}X_2=0$$
$$\frac{-l}{3EI}X_1+\frac{4l}{3EI}X_2-\frac{ql^3}{24EI}=0$$

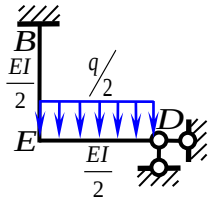
$$X_1=ql^2/56\qquad X_2=ql^2/28$$

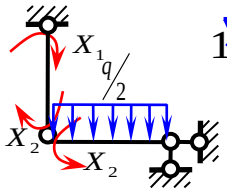
$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

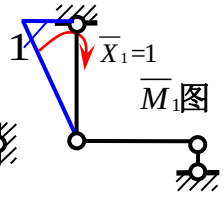
【例题32】用力法作弯矩图。（对称7-36）与7-34相同结论

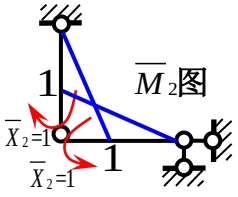


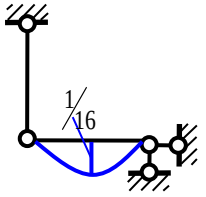








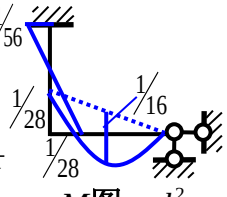


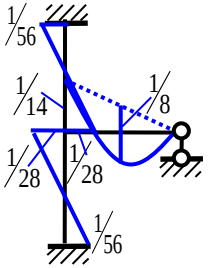


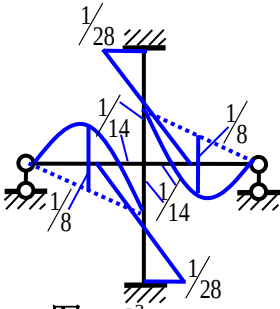
$$\delta_{11}X_1+\delta_{12}X_2+\Delta_{1P}=0$$
$$\delta_{21}X_1+\delta_{22}X_2+\Delta_{2P}=0$$

$$\delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{2l}{3EI}\qquad \delta_{22}=\sum\int\frac{\overline{M}_2\overline{M}_2}{EI}ds=\frac{4l}{3EI}$$

$$\delta_{21}=\delta_{12}=\sum\int\frac{\overline{M}_1\overline{M}_2}{EI}ds=\frac{-l}{3EI}\qquad \Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=0\qquad \Delta_{2P}=\sum\int\frac{\overline{M}_2M_P}{EI}dx=\frac{-ql^3}{24EI}$$





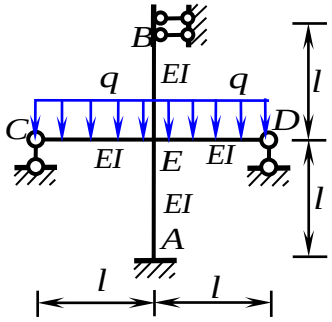


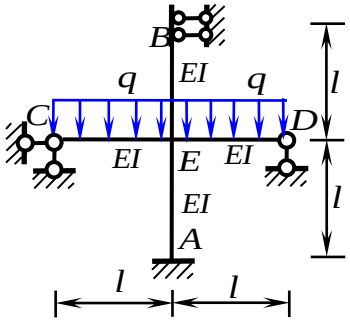
$$\frac{2l}{3EI}X_1-\frac{l}{3EI}X_2=0$$
$$\frac{-l}{3EI}X_1+\frac{4l}{3EI}X_2-\frac{ql^3}{24EI}=0$$

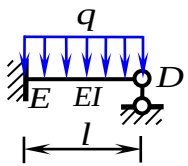
$$X_1=ql^2/56\qquad X_2=ql^2/28$$

$$M=\overline{M}_1X_1+\overline{M}_2X_2+M_P$$

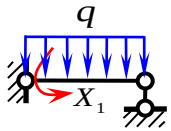
【例题33】用力法作弯矩图。（对称7-38）



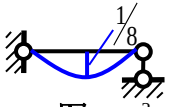




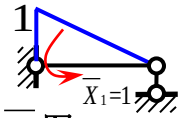
等代结构



基本体系

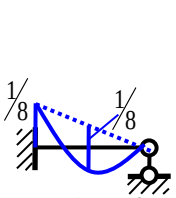


M_P图$\times ql^2$

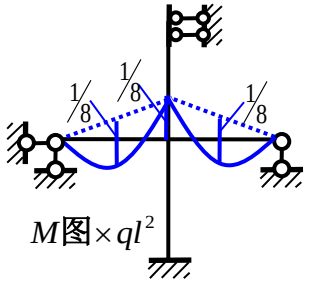


$\overline{M}_1$图

$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}$$



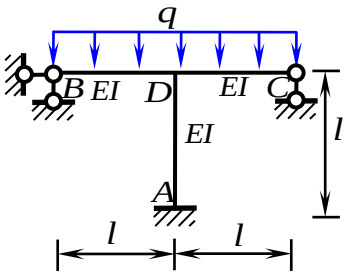
M图$\times ql^2$

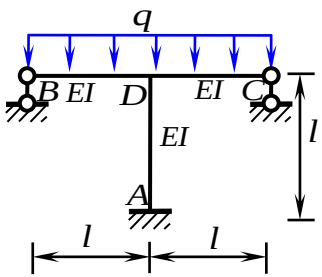


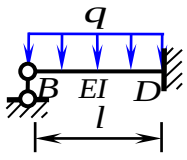
M图$\times ql^2$

$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-ql^3}{24EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=ql^2/8 \qquad M=X_1\overline{M}_1+M_P$$

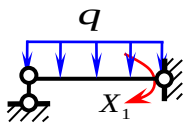
【例题34】用力法作弯矩图。（对称7-39）



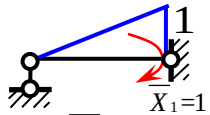




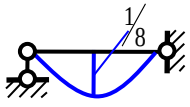
等代结构



基本体系

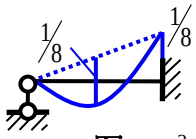


$\overline{M}_1$图

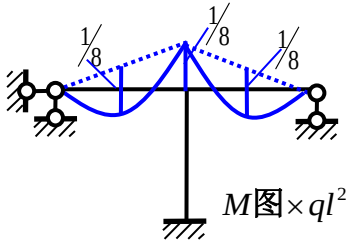


M_P图$\times ql^2$

$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}$$



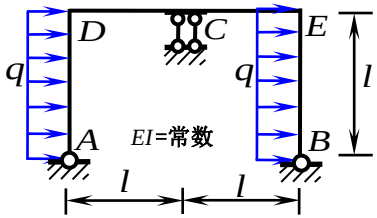
M图$\times ql^2$

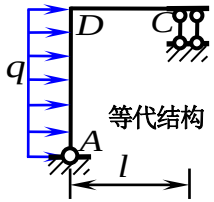


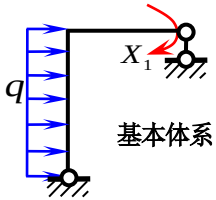
M图$\times ql^2$

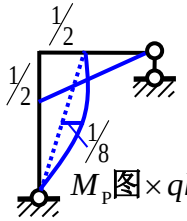
$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-ql^3}{24EI} \qquad X_1=-\Delta_{1P}/\delta_{11}=ql^2/8 \qquad M=X_1\overline{M}_1+M_P$$

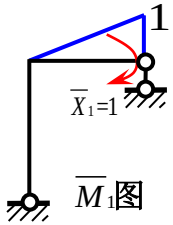
【例题35】用力法作弯矩图。（对称7-41）











$$\delta_{11}X_1+\Delta_{1P}=0 \qquad \delta_{11}=\sum\int\frac{\overline{M}_1\overline{M}_1}{EI}ds=\frac{l}{3EI}$$

$$\Delta_{1P}=\sum\int\frac{\overline{M}_1M_P}{EI}ds=\frac{-ql^3}{12EI} \qquad X_1=\frac{-\Delta_{1P}}{\delta_{11}}=\frac{ql^2}{4}$$

$$M=X_1\overline{M}_1+M_P$$