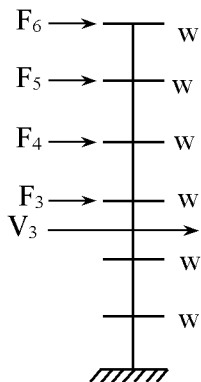


۱. ب)



W از صورت و مخرج کسر ساده می شود:

$$V=210 \quad ; \quad T=1 \quad \frac{V_3}{F_3}=? \quad k=1.25$$

$$F_j = \frac{h^k}{\sum h^k} \cdot V \quad \Rightarrow \quad F_j = \frac{j^k}{1^k + 2^k + 3^k + \dots + n^k} \cdot V$$

$$\text{مخرج کسر} = 1^{1.25} + 2^{1.25} + 3^{1.25} + 4^{1.25} + 5^{1.25} + 6^{1.25} = 29.85$$

$$F_3 = \frac{3.95}{29.85} \times 210 = 27.79$$

$$F_4 = \frac{5.65}{29.85} \times 210 = 39.54$$

$$F_5 = \frac{7.47}{29.85} \times 210 = 52.55$$

$$F_6 = \frac{9.39}{29.85} \times 210 = 66.06$$

$$\Rightarrow V_3 = 185.94 = F_3 + F_4 + F_5 + F_6 \quad , \quad \frac{V_3}{F_3} = \frac{185.94}{27.79} = 6.7$$

۳.

$$I=1 \quad , \quad R=3.5 \quad , \quad W=800+0.2 \times 500=900^{ton} \quad , \quad A=0.25 \quad , \quad H=36^m \quad , \quad V_s=400 \text{ m/s}$$

$$\text{Type II} \quad \begin{cases} T_o=0.1 \\ T_s=0.5 \\ S=1.5 \\ S_o=1 \end{cases}$$

$$\begin{cases} T_{\text{تجربی}} = 0.05 (36)^{\frac{3}{4}} = 0.735^{sec} \\ 1.25 T_{\text{تجربی}} = 0.92 \end{cases} \rightarrow T_{\text{انتخابی}} = \min \{ T_{\text{تحلیلی}} , 1.25 T_{\text{تجربی}} \} = 0.92^{sec}$$

$$\begin{cases} N = \frac{0.4}{4-0.5} (0.92-0.5)+1=1.048 \\ B_1 = (S+1) \left( \frac{T_s}{T} \right) = 2.5 \times \frac{0.5}{0.92} = 1.358 \end{cases} \rightarrow B = 1.358 \times 1.048 = \underline{1.42}$$

$$V = \frac{0.25 \times 1.42 \times 1}{3.5} \times 900 = \underline{91.286^{ton}} \geq V_{\min} = 0.12 \times 0.25 \times 1 \times 900 = 27^{ton} \quad \text{ok} \quad \checkmark$$

۴.

$$۱) \begin{cases} \text{اصفهان} \\ H = 21^m \\ \text{تیپ 4} \end{cases} \quad V_1 = ? \quad A = 0.25$$

$$۲) \begin{cases} \text{همدان} \\ H = 21^m \\ \text{تیپ 2} \end{cases} \quad V_2 = ? \quad A = 0.3$$

$$T = 0.08 \times 21^{0.75} = 0.784$$

$$\begin{cases} (1) \begin{cases} N_1 = 1 \\ B_1 = 1 + S = 3.25 \end{cases} \rightarrow 3.25 \\ (2) \begin{cases} N_2 = \frac{0.7}{4 - 0.5} (0.78 - 0.5) + 1 = 1.056 \\ B_2 = 2.5 \frac{0.5}{0.784} = 1.594 \end{cases} \rightarrow 1.68 \end{cases}$$

$$\frac{V_2}{V_1} = \frac{A_2 \cdot B_2}{A_1 \cdot B_1} \Rightarrow \frac{V_2}{V_1} = \frac{0.3}{0.25} \times \frac{B_2 \times N_2}{B_1 \times N_1} = \frac{0.3}{0.25} \times \frac{1.68}{3.25} = \underline{\underline{0.62}} \quad \text{۳۸٪ کاهش می‌یابد.}$$

۵

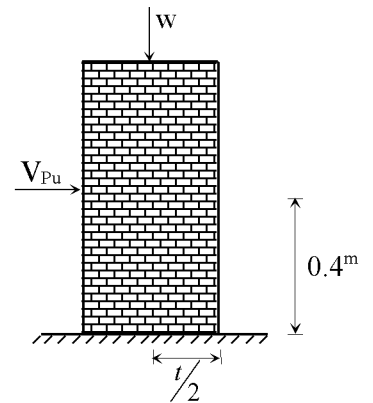
$$I = 1, \quad A = 0.3, \quad S = 1.75, \quad \gamma = 1850, \quad S.F = 1.75$$

$$W = 1850 \times 1 \times 0.8 \times t = \underline{\underline{1480 t}}$$

$$V_{Pu} = \frac{0.4 \times 2.5 \times 0.3 \times 2.75 \times 1480 t \times 1}{2.5} (3) = 1456.2 t$$

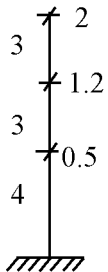
$$\text{قابل قبول} \begin{cases} V_{P \min} = 366.3 t \\ V_{P \max} = 1953.6 t \end{cases} \rightarrow \text{در رنج است.}$$

$$\frac{M_R}{M_o} \geq 1.75 \Rightarrow \frac{1480 t \times \frac{t}{2}}{1465.2 t \times 0.4} \geq 1.75 \Rightarrow \boxed{t \geq 1.39^m} \quad !!$$



۶

$$R_u = 5; \quad C_d = 4; \quad \Delta_u = C_d \cdot \Delta_r \leq 0.025h$$

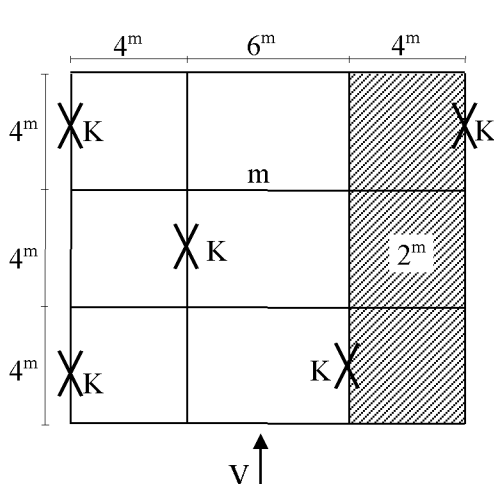


$$\Delta_{r3} = 2 - 1.2 = 0.8 \rightarrow \Delta_{u3} = 4 \times 0.8 = 3.2 \leq 0.025 \times 300 = 7.5 \quad \checkmark$$

$$\Delta_{r2} = 1.2 - 0.5 = 0.7 \rightarrow \Delta_{u2} = 4 \times 0.7 = 2.8 \leq 0.025 \times 300 = 7.5 \quad \checkmark$$

$$\Delta_{r1} = 0.5 - 0 = 0.5 \rightarrow \Delta_{u1} = 4 \times 0.5 = 2 \leq 0.025 \times 400 = 10 \quad \checkmark$$

۷



$$M_t = V(e + e_a \cdot A)$$

$$V = 100, \quad e_a = 0.05 \times 14 = 0.7$$

$$\begin{cases} x_M = \frac{m \times 10 \times 12 \times 5 + 2m \times 4 \times 12 \times 12}{m \times 10 \times 12 + 2m \times 4 \times 12} = 8.11 \\ x_S = \frac{K \times 4 + K \times 10 + K \times 14}{5K} = \frac{28}{5} = 5.6 \end{cases}$$

$$e = 8.11 - 5.6 = 2.51$$

$$M_t = 100 (2.51 + 0.7 \times 1) = \underline{\underline{321^{t.m}}}$$