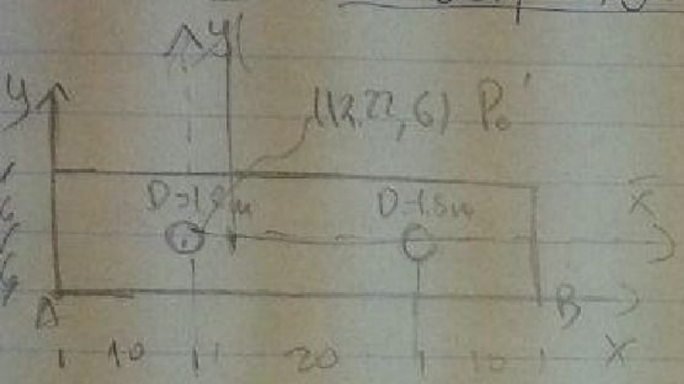
Αντισεισμικές Κατασκευές (7ου εξαμήνα) 22/12/2014

Λύση 20ης Άσκησης



- συνολικό φορτίου = 25 kN/m²
- Z_2 ($a_{gD} = 0.2g$)
- B ($S = 1.2$, $T_B = 0.15$ sec, $T_C = 0.5$ sec)
- $q = 3$ $K_x = 64000$ kN/m
- $g = 10$ m/s² $K_y = 8000$ kN/m
- $T = 0.83$ sec

- σεισμικό φορτίο $P = m \cdot S_d(T)$

όπου $S_d(T) = a_g \cdot S \cdot \frac{2.5}{q} \frac{T_C}{T} = 0.1g \cdot 1.2 \cdot \frac{2.5}{3} \cdot \frac{0.5}{0.83} \Rightarrow$

$T_C < T < T_D$

$\Rightarrow \boxed{S_d(T) = 0.147g}$ $\Rightarrow m \cdot S_d(T) = 1200\,Mg \cdot 0.147g \Rightarrow$

$\Rightarrow \boxed{P = 1764\,kN}$

- $x_{P_0} = \frac{\sum x_i \cdot K_{xi}}{\sum K_{yi}} = \frac{10 \cdot 64000 + 30 \cdot 8000}{64000 + 8000} = 12.22m$ $\boxed{x_{P_0} = 12.22m}$

- $y_{P_0} = \frac{\sum y_i \cdot K_{xi}}{\sum K_{yi}} = \frac{6 \cdot 64000 + 12 \cdot 8000}{64000 + 8000} = 6m \Rightarrow \boxed{y_{P_0} = 6m}$

- $K_y = \sum_{i=1}^{2} K_{yi} = 64000 + 8000 = 72000$ kN/m

- $K\Theta = \sum_{i=1}^{2} (K\Theta_{i,i}^{0}) + \overline{x_i}^2 K_{yi} + \overline{y_i}^2 \cdot K_{xi} = (2.22)^2 \cdot 64000 + (11.78)^2 \cdot 8000 \Rightarrow$

$\Rightarrow \boxed{K\Theta = 2844444\,kNm}$

για $\varphi = \pi/2$: $u_{x,2} = -\bar{y}_2 \Theta$

$u_{y,2} = \frac{P}{K_y} - \bar{x}_2 \Theta$

όπου $\Theta = \frac{P}{K_\Theta} \cdot \bar{x}_{sm}$

$\Theta = \frac{1764}{2344444} \cdot 7,78 = 0,004$

άρα για τα υποστυλώματα $u_{\Sigma x} = 0$ αφού $\bar{y}_s = 0$

για A,B $u_{\Sigma x} = -(-\Theta) \cdot 0,00482 \cdot 4 = 0,0289 \cdot 3 = 0,0867$

για 1 $u_{\Sigma y} = \frac{P}{K_y} + \bar{x}_s \Theta = \frac{1764}{72000} + (27,78)(0,00432) = 0,0138$ m

για 2 $u_{\Sigma y} = \frac{P}{K_y} + \bar{x}_s \Theta = \frac{1764}{72000} + (27,78)(0,00432) = 0,11$ m

για A: $u_{\Sigma y} = \frac{P}{K_y} + \bar{x}_s \Theta = \frac{1764}{72000} + (-12,22)(0,00124) = -0,103$ m

για B: $u_{\Sigma y} = \frac{P}{K_y} + \bar{x}_s \Theta = \frac{1764}{72000} + (27,78)(0,00124) = 0,0476$ m

1) με σεισμικές βάθρων $V_{y,i} = u_{y,i} \cdot K_y$

για 1: $V_{y1} = 64000 \cdot 0,0138 = 883,2$ kN $M_1 = V_{y1} \cdot \frac{4}{2} = 8 \cdot 883,2$

για 2: $V_{y2} = 8000 \cdot 0,11 = 880$ kN $M_2 = V_{y2} \cdot \frac{4}{2} = 16 \cdot 880$

$\Rightarrow$ $M_1 = 7106,56$ kNm $M_2 = 14080$ kNm

2) $u_{xA} = u_{A,x} \cdot q = 0,087$ m $u_{x,B} = u_{B,x} \cdot q = 0,087$

$u_{y,A} = u_{A,y} \cdot q = -0,103$ m $u_{yB} = u_{B,y} \cdot q = 0,476$