

ΘΕΜΑΤΑ 20-21

ΘΕΜΑ 1

$$\begin{aligned} \delta_2 &= 0,60 \cdot 8 = 4,8 \text{ cm} \\ \delta_3 &= 0,85 \cdot 8 = 6,8 \text{ cm} \end{aligned} \quad \left| \Rightarrow \vartheta = \frac{0,02}{3,50} = 0,0057 \right.$$

Από διαγράμμα ριζών

$$\begin{aligned} \text{για } \vartheta &= 0,0057 \rightarrow V = 62,875 \\ \hookrightarrow M_v &= 62,875 \cdot \pi/2 = 110 \text{ kNm} \\ &> 105 \end{aligned}$$

Δρα ροπή στο κέντρο του καπνίου M-ϑ για
 $\vartheta = 0,0057$

$$\Delta \rho \alpha \quad \mu_r = \frac{\vartheta}{\vartheta_y} = \frac{57}{40} = 1,425$$

1 → Pushover
2 → ϕ

ΘΕΜΑ 2

$$H = 3,50 \text{ m}$$

$$U_{5,1} = 0,065 \text{ m} \rightarrow U_{4,1} = 0,0597 \text{ m}$$

$$U_{5,2} = -0,009 \text{ m} \rightarrow U_{4,2} = ~~0,0022~~ - 0,0029 \text{ m}$$

" ΦΑΣΜΑΤΙΚΗ ΑΝΑΛΥΣΗ

$$\begin{aligned} \text{Σχετικές Μετακινήσεις} \quad du_1 &= 0,0053 \\ du_2 &= 0,0061 \end{aligned}$$

$$\begin{aligned} \text{χρ} \quad \text{drift}_{\perp}^{\phi} &= 0,0053 / 3,5 = 0,0015 \\ \text{drift}_{\parallel}^{\phi} &= 0,0061 / 3,5 = 0,0017 \end{aligned}$$

$$\text{χρ} \quad \text{drift}(\phi) = \sqrt{0,0015^2 + 0,0017^2} = 0,0023$$

PUSHOVER

$$\text{Σχετική Μετακίνηση} \quad du = 0,089 - 0,0818 = 0,0072$$

$$\text{χρ} \quad \text{drift}(P) = 0,0021$$

~~Από ερώτη~~

$$\text{Μετακίνηση Κορυφής} \quad U_{t,\phi} = \sqrt{0,065^2 + 0,009^2} = 0,066$$

$$\text{χρ} \quad \lambda = \frac{\Delta P}{\Delta \phi} = \frac{0,089}{0,066} = 1,35$$

Ynologypis C_E

$$\text{drift}(\phi) = \lambda \cdot \text{drift}(\phi)^{\text{exp}} = 1,35 \cdot 0,0023 = 0,0031$$

$$\text{zpa} \quad C_E = \frac{\text{drift}(\phi)}{\text{drift}(P)} = \frac{0,0031}{0,0021} = 1,476$$

$$\text{zpa} \quad C_{i,1} = 1,15 \cdot 1,476 = 1,70$$

$$\text{zpa} \quad \text{drift} = \text{drift}(P) \cdot 1,70 = 0,00357 < 0,004$$

$$\text{zpa} \quad k_g = \frac{120}{0,04} = 30000$$

$$\text{zpa} \quad M = 107,1 \text{ kNm}$$

OEMA 3

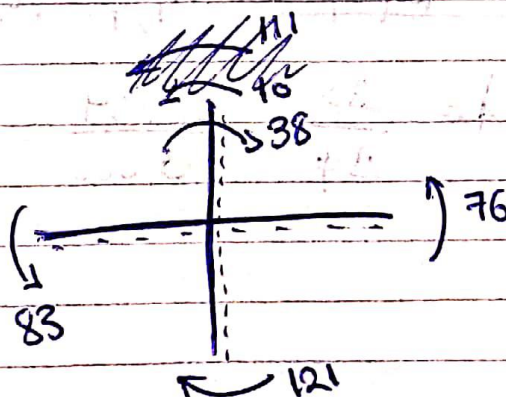
$$\text{fia} \quad G+0,3Q: N = -700 \text{ kN}$$

$$M_x = 10 \text{ kNm}$$

$$\text{fia} \quad E_x: N = 18 \text{ kN}$$

$$M_x = 111 \text{ kNm}$$

ΔΡΟΣΕΣ



$$\Sigma M_{rc} = 1,30 \Sigma M_{rb}$$

$$\rightarrow \Sigma M_{rc} = 525,2 \text{ kNm}$$

$$M_{rc, \text{top}} = 121 \cdot \frac{525,2}{121 + 38} = 399,7 \text{ kNm}$$

$$\text{kor } N_{sd} = -700 + 18 = -682 \text{ kN}$$

TEMA 4

$$\left. \begin{array}{l} \Sigma w_i \phi_i = 570 = \dot{w} \\ \Sigma w_i \phi_i^2 = 438,84 \end{array} \right\} r = \frac{570}{438,84} = 1,30$$

Supra Kolnik

$$a = r \frac{\dot{w}}{w_{\text{kon}}} = 0,823$$

$$S_{a1} = 2,16 \text{ m/s}^2 \quad S_{d1} = 0,0077$$

$$S_{a2} = 3,24 \text{ m/s}^2 \quad S_{d2} = 0,0385$$

$$\text{kor } E = \frac{1}{2} \cdot 2,16 \cdot 0,0077 + \left(\frac{3,24 + 2,16}{2} \right) \cdot (0,0385 - 0,0077)$$

$$E = 0,0915$$

$$\text{kor } S_{d,y} = 2 \cdot (S_{d, \text{max}} - E/S_{a,y})$$

$$S_{d,y} = 2 \cdot (0,0385 - 0,0915/3,24)$$

$$S_{d,y} = 0,0206 \text{ m}$$

Encom $\hat{F}_y = \hat{u} \cdot S_{xy} = 1846,8$

$\hat{T} = 2n \sqrt{\frac{\hat{u} \hat{d}^2}{\hat{F}_y}} = 0,501$

$Se = 0,24 \cdot 1,2 \cdot 2,5 \cdot \frac{0,5}{0,501} = 0,719$

$Se / S_{xy} = q = 2,22 \quad (\hat{T} > \bar{t})$

$d^* = 2,22 \cdot 0,0206 = 0,0457$

$d = r - 0,0457 = \underline{\underline{0,059 \text{ m}}}$

OBAMA 6

$$\begin{aligned}M &= 1500 \text{ Mgr} \\F_{b,y} &= 3500 \text{ kN} \\ \delta_y &= 0,01 \text{ m}\end{aligned}$$

$$\begin{aligned}\delta_{nz} &= 0,025 \text{ m} \\ \delta_{ok} &= 0,03 \text{ m}\end{aligned}$$

$$\begin{aligned}\beta_{nz} &= 0,1 \\ \beta_{ok} &= 0,6\end{aligned}$$

~~P(δ > δ_{nz})~~

Exemple $K = \frac{3500}{0,01} = 350.000 \text{ kN/m}$

Apr $T = \frac{1}{2} \sqrt{\frac{1500}{350000}} = 0,41 \text{ s}$

lia $a_g = 0,25 \rightarrow S_e = 0,25 \cdot 1 \cdot 2,5 \cdot \frac{0,4}{0,41} = 0,61 \text{ g}$

$a_g = 0,75 \rightarrow S_e = 1,83 \text{ g}$

Apr $\delta_1 = \frac{6,1 \cdot 1500}{3500} \cdot \delta = 0,026 \text{ m}$

$$\delta_2 = 0,078 \text{ m}$$

$\pi z \rightarrow a_g = 0,25 \text{ g} \rightarrow P(\delta > \delta_{\pi z}) = \Phi(0,098) \rightarrow 54\%$
 $\rightarrow a_g = 0,75 \text{ g} \rightarrow P(\delta > \delta_{\pi z}) = \Phi(2,84) \rightarrow 99,8\%$

$ok \rightarrow a_g = 0,25 \text{ g} \rightarrow P(\delta > \delta_{ok}) = \Phi(-0,36) \rightarrow 36\%$
 $\rightarrow a_g = 0,75 \text{ g} \rightarrow P(\delta > \delta_{ok}) = \Phi(2,39) \rightarrow 99,1\%$