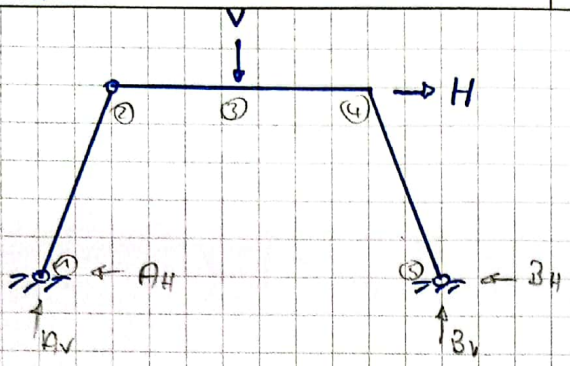
Projekt:	Bearbeiter:	Datum:
4. Belg. FORM	Philipp Göbel 4607083	23.06.23
		Blatt: 1



maßgebende Stellen 3 und 4

$\Sigma M^A = 0 = 5V + 4H - 10B_V \rightarrow B_V = \frac{1}{2}V + \frac{2}{5}H$

$\Sigma V = 0 = -A_V - B_V + V \rightarrow A_V = \frac{1}{2}V - \frac{2}{5}H$

$\Sigma M^B = 0 = 2A_V + 4A_H \rightarrow A_H = -\frac{1}{4}V + \frac{1}{5}H$

$\Sigma H = 0 = A_H + B_H - H \rightarrow B_4 = \frac{1}{4}V + \frac{4}{5}H$

$\Rightarrow M^{③} = 3 \cdot A_V = \frac{3}{2}V - \frac{6}{5}H$

$M^{④} = 2 \cdot B_V - 4B_4 = -\frac{12}{5}H$

Aufgabe 1:

$③: -\frac{1}{W_{pl}}\left[\frac{3}{2}(6 \cdot X_1 + 40) - \frac{6}{5}(2X_1)\right] = -\frac{1}{W_{pl}}\left[60 - \frac{33}{5}X_1\right]$

$④: \frac{1}{W_{pl}}\left[-\frac{12}{5} \cdot (2X_1)\right] = \frac{1}{W_{pl}}\left[-\frac{24}{5}X_1\right]$

$\beta_{③} = \frac{c_{03} + c_{13} \cdot \mu_{x1} + \mu_{x2}}{((c_{13} \cdot \sigma_{x1})^2 + \sigma_{x2}^2)^{0.5}}$ mit $\begin{cases} c_{03} = -\frac{60}{W_{pl}} = -36855{,}04 \\ c_{13} = \frac{33}{5W_{pl}} = 4054{,}05 \end{cases}$

$= 11{,}199$

$\beta_{④} = \frac{c_{14} \cdot \mu_{x1} + \mu_{x2}}{((c_{14} \cdot \sigma_{x1})^2 + \sigma_{x2}^2)^{0.5}}$ mit $c_{14} = -2948{,}40 = -\frac{24}{5W_{pl}}$

$= 6{,}599$ → maßgebend

$P_{f4}(\beta_4) = 1 - \Phi(\beta_4) = 2{,}07 \cdot 10^{-11}$

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Aufgabe 2

③: $-\frac{1}{\omega_{pl}}\left[\frac{3}{2}\cdot(6X_2+40)-\frac{6}{5}(2X_1)\right] = -\frac{1}{\omega_{pl}}\left[-\frac{12}{5}X_1+9X_2+60\right]$

④: $\frac{1}{\omega_{pl}}\left[-\frac{12}{5}(2X_1)\right] = \frac{1}{\omega_{pl}}\left[-\frac{24}{5}X_1\right]$

$$\beta_③ = \frac{c_{03}+c_{13}\cdot\mu_{x1}+c_{23}\mu_{x2}+\mu_{x3}}{((c_{13}\cdot\sigma_{x1})^2+(c_{23}\sigma_{x2})^2+\sigma_{x3}^2)^{0.5}}$$

mit $c_{03} = -\frac{60}{\omega_{pl}} = -36855,04$

$c_{13} = \frac{12}{5\omega_{pl}} = 1474,20$

$c_{23} = -\frac{9}{\omega_{pl}} = -5528,26$

$= 3,327$ → maßgebend

$$\beta_④ = \frac{c_{14}\cdot\mu_{x1}+\mu_{x3}}{((c_{14}\cdot\sigma_{x1})^2+\sigma_{x3}^2)^{0.5}} \quad \text{mit } c_{14} = \frac{24}{5\omega_{pl}} = 2948,40$$

$= 12,450$

$P_{f3}(\beta_3) = 1-\Phi(\beta_3) = 0,000438$

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Aufgabe 3

$$a = \frac{\bar{u}}{\sqrt{6}} \cdot \frac{1}{\sigma_{x_1}} = 0{,}257$$

$$b = \mu_{x_1} - \frac{0{,}572}{a} = 22{,}175$$

$$\sigma_u = \sqrt{\ln\left(1 + \frac{\mu_{x_2}}{\sigma_{x_2} - x_{02}}\right)^2} = 1{,}536$$

$$\mu_u = \ln(\sigma_{x_2} - x_{02}) - \frac{\sigma_u^2}{2} = 10{,}730$$

$$③: -\frac{1}{w_{p1}}\left[\frac{3}{2}(13X_1 + 40) - \frac{6}{5}(6X_1)\right] = -\frac{1}{w_{p1}}\left[12{,}3X_1 + 60\right]$$

$$④: \frac{1}{w_{p1}}\left[-\frac{12}{5} \cdot 6X_1\right] = \frac{1}{w_{p1}}\left[-14{,}4X_1\right]$$

$$h_j(y) = h_j(y_1, y_2) = c_{1j}\left(\frac{-\ln}{\ln(\Phi^{NV}(y_1))}\right)^{\frac{1}{k}} + e^{y_2\sigma_u + \mu_u} + x_{0,2} = 0$$

mit $F(x_1) = \exp(-\exp(-a(x_1 - b))) \rightarrow y_1 = \hat{a} \cdot \ln(\ln(\Phi^{NV}(y_1))) + b$

$$y_2 = \frac{\ln(x_2) - \mu_u}{\sigma_u} \rightarrow x_2 = \sigma_u \cdot \exp(\sigma_u \cdot y_2 + \mu_u)$$

$$h_j(y_1, y_2) = c_{0j} + c_{1j}\left(\frac{1}{a} \cdot \ln(\ln(\Phi^{NV}(y_1))) + b\right) + \sigma_u \exp(\sigma_u \cdot y_2 + \mu_u) + x_{0,2} = 0$$

$$H(y^*)_j = \begin{bmatrix} \frac{\partial h_j(\underline{y})}{\partial y_1}\Big|_{\underline{y}=\underline{y}^*} \\ \frac{\partial h_j(\underline{y})}{\partial y_2}\Big|_{\underline{y}=\underline{y}^*} \end{bmatrix} = \begin{bmatrix} \frac{c_{1j} \cdot \frac{1}{a} \cdot \varphi^{NV}(y_1^*)}{\Phi^{NV}(y_1^*) \cdot \ln(\Phi(y_1))} \\ \sigma_u \cdot \exp(\sigma_u y_2 + \mu_u) \end{bmatrix}$$

$$\beta_j(\underline{y}_j^*) = \frac{h_j(\underline{y}_j^*) - \underline{H}_j^T(\underline{y}_j^*) \cdot \underline{y}_j^*}{(\underline{H}_j^T(\underline{y}_j^*) \cdot \underline{H}_j(\underline{y}_j^*))^{0,5}} \quad ; \quad \alpha_j(\underline{y}_j^*) = \frac{-\underline{H}_j(\underline{y}_j^*)}{(\underline{H}_j^T(\underline{y}_j^*) \cdot \underline{H}_j(\underline{y}_j^*))^{0,5}}$$

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$$\underline{y}_j^* = \alpha_j(\underline{y}_j^*) \cdot \beta_j(\underline{y}_j^*)$$

~~Startwert $\underline{y}^* = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$~~

$$\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_0^z e^{-\frac{x^2}{2}} dx \qquad \varphi(x) = \frac{1}{2\pi} e^{-\frac{x^2}{2}}$$

Startwert $\underline{y}^* = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$\Rightarrow$ nach 2000 Iterationen (siehe Anhang)

$\beta = 4{,}52 \cdot 10^{-7}$

$P_f(\beta) = 1 - \Phi(\beta) = 0{,}4999$