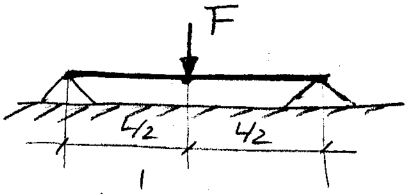
LÖSUNGSWEG:

1) ZUGSTAB: $\underline{\underline{C_1^* = \frac{E\cdot A}{L}}}$

BIEGEBALKEN: $\underline{\underline{C_2^* = \frac{48EI}{L^3}}}$ aus



mit $C^* \overset{!}{=} \frac{F}{W(\frac{L}{2})}$

$$\left[\begin{array}{l} F = c\cdot\Delta x \quad \text{bzw.} \quad F = c\cdot W \\ \blacktriangleright \quad c = \frac{F}{W} \quad \text{bzw.} \quad W = \frac{F}{c} \end{array}\right]$$

2) LINKE SEITE: REIHENSCHALTUNG!

$$\frac{1}{C_{1,Ges}} = \frac{1}{C_1} + \frac{1}{C_1^*} = \frac{C_1^*}{C_1C_1^*} + \frac{C_1}{C_1C_1^*} = \frac{C_1^* + C_1}{C_1C_1^*}$$

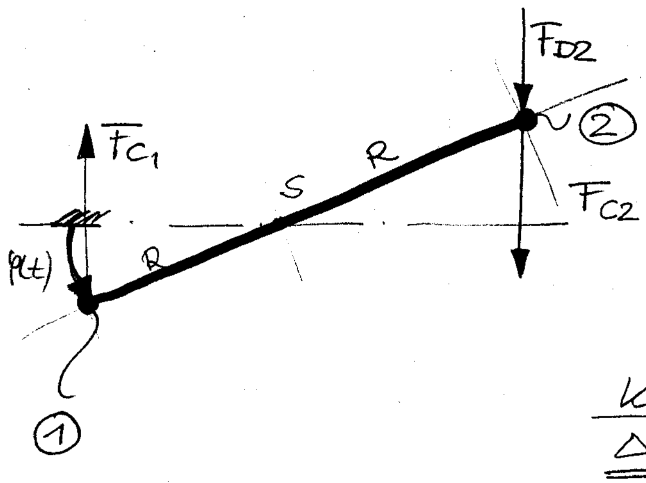
$$\rightarrow \quad \underline{\underline{C_{1,Ges}}} = \frac{C_1C_1^*}{C_1 + C_1^*} = \underline{\underline{\frac{C_1\left(\frac{EA}{L}\right)}{C_1 + \left(\frac{EA}{L}\right)}}}$$

RECHTE SEITE: REIHENSCHALTUNG!

$$\frac{1}{C_{2,Ges}} = \frac{1}{C_2} + \frac{1}{C_2^*}$$

$$\rightarrow \quad \text{z.B.:} \quad \underline{\underline{C_{2,Ges}}} = \frac{C_2C_2^*}{C_2 + C_2^*} = \underline{\underline{\frac{C_2\left(48EI/L^3\right)}{C_2 + \left(48EI/L^3\right)}}}$$

3) KLEINE DREHWINKEL!



KINEMATIK: KLEINE WINKEL!

$\underline{\underline{\Delta y(t)}} \approx R\cdot\sin\varphi(t) \approx \underline{\underline{R\cdot\varphi(t)}}$

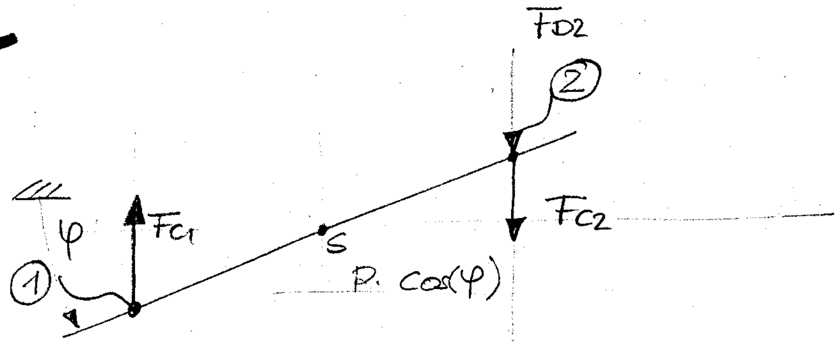
KRÄFTE:

$$F_{C1} = C_{1,Ges}\cdot\Delta y(t) = C_{1,Ges}\cdot R\cdot\varphi(t) \quad \text{(FEDER 1)}$$

$$F_{C2} = C_{2,Ges}\cdot\Delta y(t) = C_{2,Ges}\cdot R\cdot\varphi(t) \quad \text{(FEDER 2)}$$

$$F_{D2} = \kappa\cdot\Delta\dot{y}(t) = \kappa\cdot R\cdot\dot{\varphi}(t) \quad \text{(DÄMPFER 2)}$$

4)



DRALLSATZ: $\Theta_S \cdot \ddot{\varphi}(t) = \sum M_{(S)} =$

$$-F_{C1} \cdot R \cdot \cos\varphi - F_{C2} \cdot R \cdot \cos\varphi - F_{D2} \cdot R \cdot \cos\varphi$$

KLEINE WINKEL: $\cos\varphi \approx 1$!

$$\Theta_S \ddot{\varphi}(t) = -F_{C1} \cdot R - F_{C2} \cdot R - F_{D2} \cdot R$$

$$\Theta_S \ddot{\varphi} + R \cdot F_{D2} + R(F_{C1} + F_{C2}) = 0$$

EINSETZEN + NORMIEREN:

$$\Theta_S \ddot{\varphi}(t) + R^2 k \dot{\varphi}(t) + R^2 (C_{1,Ges} + C_{2,Ges}) \varphi(t) = 0$$

$$\ddot{\varphi}(t) + \frac{R^2 k}{\Theta_S} \dot{\varphi}(t) + \frac{R^2 (C_{1,Ges} + C_{2,Ges})}{\Theta_S} \dot{\varphi}(t) = 0$$

$$\ddot{\varphi} + 2\delta \dot{\varphi} + \omega^2 \varphi = 0$$

mit $\delta = \frac{R^2 k}{2\Theta_S}$; $\omega^2 = \frac{R^2}{\Theta_S}(C_{1,Ges} + C_{2,Ges})$

ANSATZ + ABLEITUNGEN: $\varphi(t) = \hat{\varphi} \cdot e^{\lambda t}$

$\dot{\varphi}(t) = \hat{\varphi} \lambda e^{\lambda t}$; $\ddot{\varphi}(t) = \hat{\varphi} \lambda^2 e^{\lambda t}$

EINSETZEN + KÜRZEN: $\cancel{\hat{\varphi}} \lambda^2 \cancel{e^{\lambda t}} + \cancel{\hat{\varphi}} \cdot 2\delta\lambda \cancel{e^{\lambda t}} + \cancel{\hat{\varphi}} \omega^2 \cancel{e^{\lambda t}} = 0$

CHARAKT. POLYNOM: $\lambda^2 + 2\delta\lambda + \omega^2 = 0$

LÖSUNG: $\lambda_{1,2} = -\delta \pm \sqrt{\delta^2 - \omega^2}$