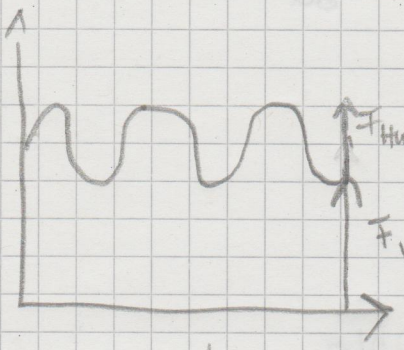
K2
Probeklausur
Blatt 05

Aufgabe 2.1

a) $c_F = \frac{G d^4}{8 D_m^3 i_f} = 53{,}71 \frac{N}{mm}$

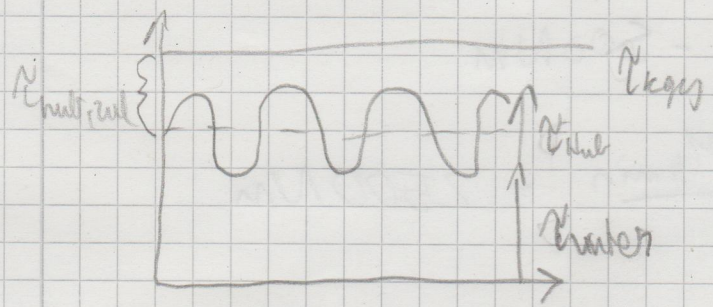


b) $F_{hub} = c_F \cdot w_B = 450\,N$

c) $F_{ges} = F_v + F_{hub} = 730\,N$

$\tau_{max} = \frac{M}{W} = \frac{F_{ges} \cdot \frac{D_m}{2} \cdot 16}{\pi d^3} = 416{,}4 \frac{N}{mm^2}$

$\tau_{zul} = 700 \frac{N}{mm^2}$ $\quad \tau_{max} < \tau_{zul}$ ✓



d) $\tau_{unten} = K \cdot \tau_{Vorsp}$

$w = \frac{D_m}{d} = 5{,}6 \Rightarrow K = 1{,}25$

$\tau_{vors} = \frac{M}{W} = \frac{F_v \cdot \frac{D_m}{2} \cdot 16}{\pi d^3} = 159{,}72 \frac{N}{mm^2}$

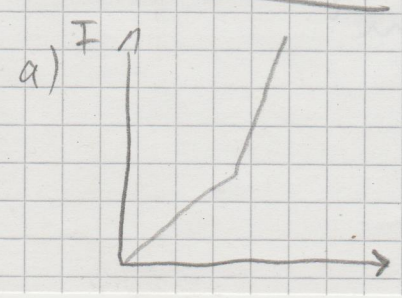
$\Rightarrow \tau_{Vorsp} = 199{,}64 \frac{N}{mm^2}$

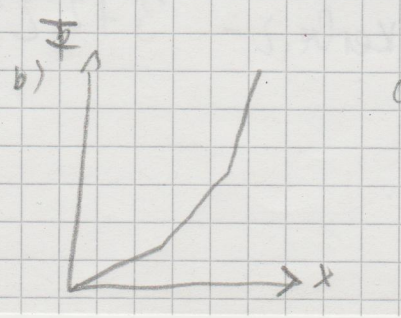
$\tau_{Hub,zul} = \tau_{k\,ges} - \tau_{unten} = 350{,}36 \frac{N}{mm^2}$

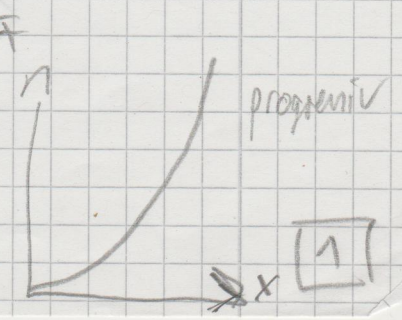
$S = \frac{\tau_{Hub,zul}}{\tau_{Hub}} = 1{,}43 < 1{,}5$

$\Rightarrow$ Feder nicht dauerfest

Aufgabe 2.1

a) 

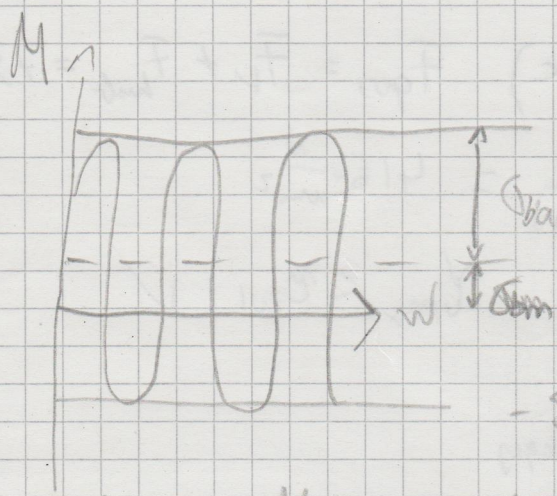
b) 

c) 

4. Aufgabe

$$\sigma_{Kerb,1} = \beta_1 \cdot \sigma_{ba1} = \frac{\alpha_1}{n_1} \cdot \sigma_{ba}$$

$$\sigma_{Kerb,2} = \frac{\alpha_2}{n_2} \cdot \sigma_{ba2}$$



$$M_{ba} = \frac{M_{bmax} - M_{bmin}}{2} = 2500\,Nm$$

$$M_{bm} = M_{bmax} - M_{ba} = 2000\,Nm$$

$$\sigma_{ba1} = \frac{M_{ba} \cdot 32}{\pi d^3} = 203{,}72 \frac{N}{mm^2}$$

$$\frac{r}{t_1} = 1{,}25 \qquad \frac{d}{D_1} = 0{,}84 \Rightarrow \alpha_1 = 1{,}6$$

$$\frac{r_2}{t_2} = 1 \qquad \frac{d_2}{D_2} = 0{,}75 \Rightarrow \alpha_2 = 1{,}7$$

$$\Rightarrow \sigma_{Kerb,1} = 516{,}65 \frac{N}{mm^2}$$

$$\sigma_{Kerb,2} = 372{,}23 \frac{N}{mm^2}$$

Theoriefragen:

1) richtig
2) falsch
3) richtig
4) falsch
5) falsch

4.3 Grundlagen

$F_{zdm} = 0$ $\quad F_{zda} = 0$

$M_{bm} = 0$ $\quad M_{ba} \neq 0$

$M_{tm} \neq 0$ $\quad M_{ta} = 0$

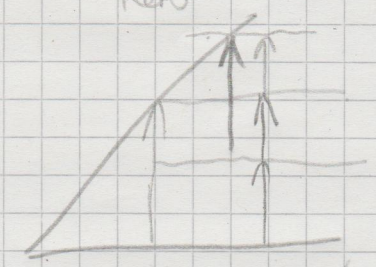
3. Schraubenaufgabe

a) $F_V = 70\,000\,N \quad \pm 15\%$

$F_A = 30\,000\,N$ (schwellend)

S_P, S_S gegeben

b) $F_{Kerb} = 30000\,N$



$F_{V_{min}} = F_V \cdot 15\% = 59500\,N$

$F_{TA} = (1 - \Phi) F_A =$

$\Phi =$ $\quad = 0{,}68$

$F_{Kmin} = F_{Vmin} \cdot F$ $\quad = 31900N$

erforderl. Klemmkraft wird erreicht!

c) $\sigma_A = 60 \frac{N}{mm^2}$

10.9 Festigkeitsklasse $\quad \sigma_{zmin} = \frac{F}{A} = \frac{F_{SA}}{2 \cdot A_S}$

$S_{0min} = 3$ $\quad A_T = 113{,}1\,mm^2$ $\quad = 8{,}82 \frac{N}{mm^2}$

$A_S = 1.36 mm^2$

A { dynamisch A_S
  { statisch { Schaft A_S
             { Dehn A_t

$$S_D = \frac{\sigma_A}{\quad} = 6{,}8$$

$6{,}8 > 3$ ✓

d) $F_a = p \cdot A = 60\,bar \cdot \frac{\pi}{4}(40\,mm^2)$

$= 60 \cdot 10^5 \frac{N}{mm^2} \cdot \frac{\pi}{4} \cdot mm^2$

$= 7539{,}82\,N$

$\Rightarrow F_{A,1} = \frac{F_a}{4} = 1884{,}93\,N$