

**Aufgabe I.2.4**

a)  $f_b = 2f_1 = 2f_0 \rightarrow t_p = \frac{1}{f_0} = \frac{1}{f_a} = \frac{2}{f_b}$        $u_p(t) = \underbrace{\hat{u}_a}_{a_1} \cos(2\pi f_0 t) + \underbrace{\hat{u}_b}_{a_2} \cos(2\pi 2f_0 t)$

$c_\mu = \frac{a_\mu - j b_\mu}{2}$  ;  $c_1 = \frac{a_1}{2} = \frac{\hat{u}_a}{2} \rightarrow c_1 = c_1^* = \frac{\hat{u}_a}{2}$  ;  $c_2 = \frac{a_2}{2} = \frac{\hat{u}_b}{2} \rightarrow c_2 = c_2^* = \frac{\hat{u}_b}{2}$

$u_p(t) = \underbrace{\frac{\hat{u}_b}{2} \cdot e^{-j2\pi 2f_0 t} + \frac{\hat{u}_a}{2} \cdot e^{-j2\pi f_0 t}}_{\text{negative Frequenzen}} + \underbrace{\frac{\hat{u}_a}{2} \cdot e^{j2\pi f_0 t} + \frac{\hat{u}_b}{2} \cdot e^{j2\pi 2f_0 t}}_{\text{positive Frequenzen}}$

b)  $f_b = \frac{3}{2}f_a \rightarrow f_b = 3f_0, f_a = 2f_0$        $u_p(t) = \underbrace{\hat{u}_a}_{a_2} \cos(2\pi 2f_0 t) + \underbrace{\hat{u}_b}_{a_3} \cos(2\pi 3f_0 t)$

$c_2 = \frac{\hat{u}_a}{2} \rightarrow c_2^* = \frac{\hat{u}_a}{2}$  ;  $c_3 = \frac{\hat{u}_b}{2} \rightarrow c_3^* = \frac{\hat{u}_b}{2}$

$u_p(t) = \underbrace{\frac{\hat{u}_b}{2} \cdot e^{-j2\pi 3f_0 t}}_{c_3^*} + \underbrace{\frac{\hat{u}_a}{2} \cdot e^{-j2\pi 2f_0 t}}_{c_2^*} + \underbrace{\frac{\hat{u}_a}{2} \cdot e^{j2\pi 2f_0 t}}_{c_2} + \underbrace{\frac{\hat{u}_b}{2} \cdot e^{j2\pi 3f_0 t}}_{c_3}$