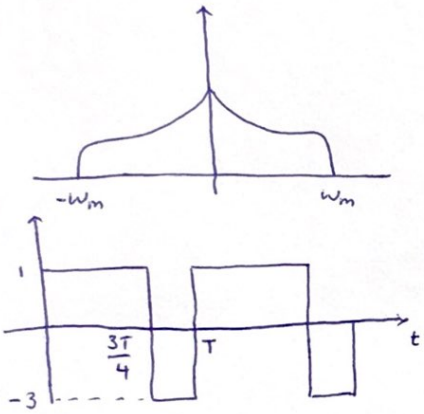
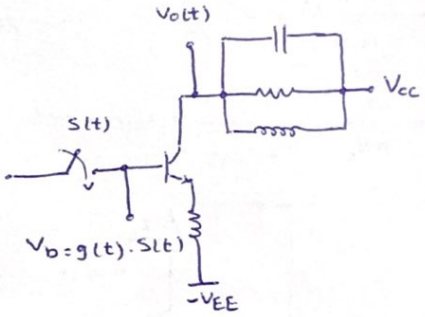
بالطیف

رضا ادیب زاده
۹۸۱۴۳۰۳
تمرین سری ۶ مدار مخابراتی

#3



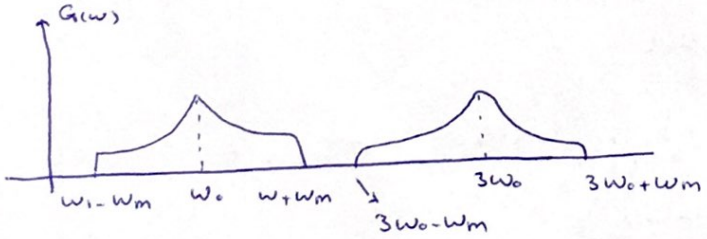


$$S(t) = \frac{a_0}{2} + \sum_{n=-\infty}^{+\infty} a_n \cos w_0 t + b_n \sin w_0 t \quad \Rightarrow \quad a_0 = \frac{1}{T}\int_0^T S(t)\,dt = \frac{1}{T}\int_0^{\frac{3T}{4}} 1\,dt - 3\int_{\frac{3T}{4}}^{T} dt = 0$$

$$b_n = \frac{2}{T}\int S(t)\sin w_0 t\,dt = 0$$

$$a_n = \frac{2}{T}\int_0^T S(t)\cos n w_0 t\,dt = \frac{2}{T}\left(\int_0^{\frac{3T}{4}} \cos n w_0 t - 3\int_{\frac{3T}{4}}^{T} \cos n w_0 t\right) = \frac{-1}{n\pi}$$

$$\Rightarrow S(t) = \sum_{n=0}^{\infty} a_n \cos w_0 t \Rightarrow V_b(t) = g(t)S(t) = \frac{-1}{n\pi} g(t)\cos w_0 t + \frac{-1}{8\pi} g(t)\cos w_0 t$$



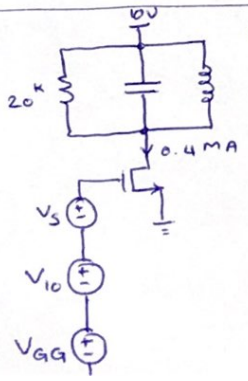
$$BW = w_0 - w_m - (w_0 - w_m) = 2w_m$$

$$3w_0 - w_m > w_0 + w_m$$

$$\Rightarrow 2w_0 > 2w_m$$

$$\Rightarrow \boxed{w_0 > w_m}$$

#5



$Q = 25$

$$\begin{cases} K' = 30\ \frac{\mu A}{V^2} \\ V_T = 0.6\,V \\ \frac{W}{L} = 20 \\ \lambda = \gamma = 0 \end{cases}$$

$$g_{oss} = \frac{2I_{DSS}}{|V_P|}\left(1-\frac{V_{GS}}{V_P}\right) = \frac{2I_{DSS}}{|V_P|} = g_{mQ}$$

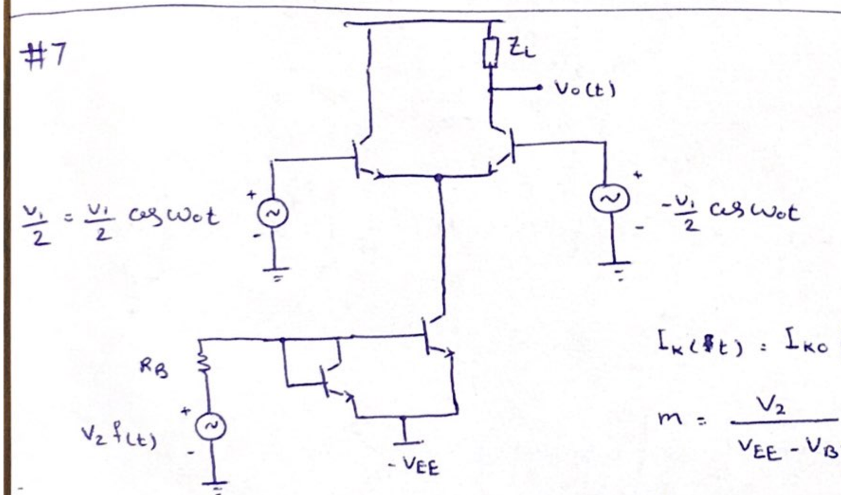
$$r_{DSS} = \frac{1}{g_{mQ}} \quad , \quad V_{GS}=0 \quad , \quad |V_{DS}| = |V_A| \le 100^{mV}$$

$$V_a(t) = V_{DS}(t) = \frac{r_{DSS}}{R+r_{DSS}}\, g(t)$$: شرایط وصل بودن فت

$$R > r_{DSS}\left(\frac{|g(t)|_{max}}{100^{mV}} - 1\right)$$: شرط عملکرد صحیح فت

$$V_a(t) = V_{ce} + \frac{2}{\pi R_E}\cdot\frac{R}{R+r_{DSS}}\, g(t)\cos\omega_c t$$

#7



$$I_K(t) = I_{KO}\left(1+mf(t)\right) \quad , \quad I_{KO} = \frac{\beta}{\beta+2}\times\frac{V_{EE}-V_{BE}}{R_B}$$

$$m = \frac{V_2}{V_{EE}-V_{BE}}$$

~~$i_{c_2}(t) = -\alpha I_{KO}(t)\, a_1(x)\left(1+mf(t)\right)\cos\omega_c t$~~

$$\Rightarrow i_{c_2}(t) = \alpha\frac{I_K(t)}{2} - \alpha I_K(t)\sum_{n=1}^{\infty} a_{2n-1}(x)\cos\left((2n+1)\omega_c t\right) \quad , \quad x = \frac{V_2}{V_T}$$

$$i_{c_2}(t) = -\alpha I_{KO}(t)\, a_1(x)\left(1+mf(t)\right)\cos\omega_c t$$

$$\Rightarrow V_o(t) = V_{CC} + \alpha I_{KO}\, a_1(x)\cdot\left(1+mf(t) * h_L(t)\right)\cos\omega_c t$$

$h_L(t)$: پاسخ ضربه معادل پایین گذر فیلتر خروجی (Z_L) است.
