3.9 $\varphi = \cos^{-1}\frac{U_T + E_B}{U_b} = 90°$ $\alpha_0(\varphi)=0.3183,\ \alpha_1(\varphi)=0.5$

$\eta_c = \frac{1}{2}\frac{\alpha_1(\varphi)}{\alpha_0(\varphi)}\xi = 75.4\%$ $\xi = \frac{U_c}{V_{cc}} \Rightarrow U_c = 28.8V$

临界: $V_{cc} - \frac{V_{cc} - U_c\cos\varphi}{1 + \frac{C_{cr}U_c}{g_m U_b}} = U_c$

$\Rightarrow g_m U_b = 0.48A$

$I_{cp} = g_m U_b(1-\cos\varphi) = 0.48A$

$I_{c1} = I_{cp}\alpha_1(\varphi) = 0.24A$

$P_o = \frac{1}{2}I_{c1}U_c = 3.456W$

$R_T = \frac{U_c}{I_{c1}} = 120\Omega$

$P_c = P_{DC} - P_o = \frac{P_o}{\eta_c} - P_o = 1.128W$

3.11 临界状态 $\eta_c = \frac{\alpha_1(\varphi)}{2\alpha_0(\varphi)}\xi = 60\% \Rightarrow \xi = 0.895$

∵ V_{cc}、U_c保持不变 ∴ ξ不变

改变后 $\eta_c' = \frac{\alpha_1(\varphi')}{2\alpha_0(\varphi')}\xi = 68\%$

$\Rightarrow \varphi' = 26.73°$

∵ U_{BEmax}不变 故仍工作于临界状态

$P_o = \frac{1}{2}I_{c1}U_c = \frac{1}{2}I_{cp}\alpha_1(\varphi)U_c$

$\Rightarrow P_o' = \frac{\alpha_1(\varphi')}{\alpha_1(\varphi)}P_o = 1.329$

φ变小, $I_{c1} = I_{cp}\alpha_1(\varphi)$变小,

$R_T = \frac{U_c}{I_{c1}}$ 变大

3.12 (1) 欠压状态

(2) M点横坐标：$V_{cc}-U_c=14$

N点横坐标：$V_{cc}-U_c\cos\varphi=22$

K点横坐标：$V_{cc}+U_c=34$

$\Rightarrow V_{cc}=\frac{14+34}{2}=24V$，$U_c=10V$

$\varphi=\cos^{-1}\frac{V_{cc}-22}{U_c}=78.46°$

(3) R应变大，当工作于临界状态时求最大η_c

$U_c'=24-5=19V$，φ不变

$\alpha_1(\varphi)=0.472-\frac{0.472-0.4549}{80-75}(80-78.46)=0.4667$

$\alpha_0(\varphi)=0.286-\frac{0.286-0.2693}{80-75}(80-78.46)=0.2809$

$\eta_c'=\frac{1}{2}\frac{\alpha_1(\varphi)U_c'}{\alpha_0(\varphi)V_{cc}}=65.8\%$

3.13 由图 $V_{cc}=12V$，$U_c=V_{cc}-0.8=11.2V$

N(0.8,400)，A(12,400) 故N为AM中点。

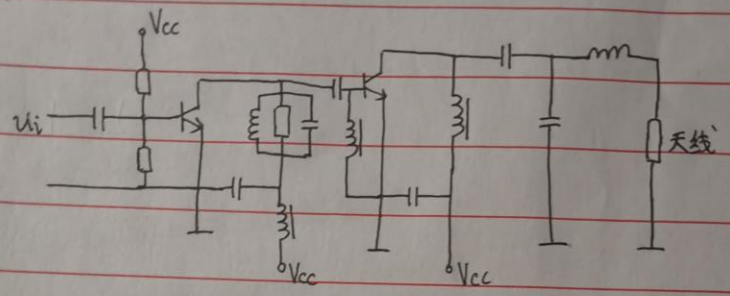
$\therefore N(6.4,0)$ $V_{cc}-U_c\cos\varphi=6.4$

$\Rightarrow\varphi=60°$ $\eta_c=\frac{1}{2}\frac{\alpha_1(\varphi)}{\alpha_0(\varphi)}\frac{U_c}{V_{cc}}=83.7\%$

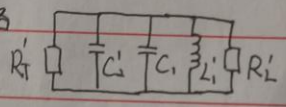
$I_{c1}=I_{cp}\alpha_1(\varphi)=0.1564A$

$P_o=\frac{1}{2}I_{c1}U_c=8.7584W$

3.14



3.16 等效电路



(1) $\begin{cases} R_T' = R_T(1+Q_{e2}^2) \\ X_{C_2}' = X_{C_2}(1+\frac{1}{Q_{e2}^2}) \\ R_L' = R_L(1+Q_{e1}^2) \\ X_{L_1}' = X_{L_1}(1+\frac{1}{Q_{e1}^2}) \end{cases}$ 其中 $Q_{e1}=\frac{|X_{L1}|}{R_L}$, $Q_{e2}=\frac{|X_{C2}|}{R_L}$

(2) $f = 50\,MHz$, $\omega = 2\pi f = 10^8\pi\ rad/s$

匹配条件 $R_L' = R_T'$

$\Rightarrow Q_{e2} = \sqrt{\frac{R_L}{R_T}(1+Q_{e1}^2)-1} = 2.408$

$|X_{C2}| = Q_{e2}R_T = 602 = |-\frac{1}{\omega C_2}| \Rightarrow C_2 = 5.288\,pF$, $C_2' = \frac{1}{(1+\frac{1}{Q_{e2}^2})}C_2 = 4.507\,pF$

$|X_{L1}| = Q_{e1}R_L = 400 = |\omega L_1| \Rightarrow L_1 = 1.273\,\mu H$, $L_1' = (1+\frac{1}{Q_{e1}^2})L_1 = 1.353\,\mu H$

谐振 $\frac{1}{X_{L_1}'} + \frac{1}{X_{C_1}} + \frac{1}{X_{C_2}'} = 0$

$\frac{1}{\omega L_1'} - \omega C_1 - \omega C_2' = 0 \Rightarrow \omega^2 L_1'(C_1+C_2') = 1$

$\Rightarrow C_1 = 2.98\,pF$