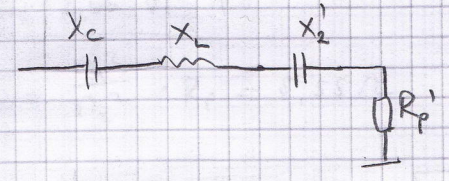
3. M1

(23)



$U_s = 1{,}2\ V$

$X_1 = \frac{1}{2\pi f C_1} = 102\ \Omega$ $\qquad X_2 = \frac{1}{2\pi f C_2} = 26{,}5\ \Omega$

$R_p' = \frac{R_p X_2^2}{R_p^2 + X_2^2} = 11\ \Omega$ $\qquad X_2' = \frac{R_p^2 \cdot X_2}{R_p^2 + X_2^2} = 20{,}7\ \Omega$

$X_L = X_1 + X_2' = 122{,}7\ \Omega \Rightarrow L = \frac{X_L}{2\pi f} = 32{,}55\ \mu H$

$U_{c1m} = \frac{2}{\pi}(U_{cc} - 2U_s) = 9{,}93\ V$

$P_K = \frac{U_{cm}^2}{2R_p'} = \frac{9{,}93^2}{2 \cdot 11} = 4{,}48\ W$

$I_{cc} = \frac{2}{\pi R_p}(U_{cc} - 2U_s) = 287\ mA$

$P_{cc} = U_{cc} I_{cc} = 5{,}17\ W$

$\eta = \frac{P_K}{P_{cc}} = 86{,}6\ \%$

$P_K = \frac{U_{Rm}^2}{2R_p}$

$U_{Rm} = \sqrt{2P_K \cdot R_p} = 21{,}2\ V$

$P_c = P_{cc} - P_K = 0{,}69\ W$

$P_{C1} = P_{C2} = \frac{P_c}{2} = 0{,}35\ W$

(24) $P_k = \frac{(U_{cc} - U_s)^2}{2R_c}$ $\qquad U_{cm} = U_{cc} - U_s$

$R_c = \frac{U_{cm}^2}{2P_k} = 84,5\ \Omega$

$U_{cmax} = U_{cc} + U_{cm} = 28\ V$

$I_{cm} = \sqrt{\frac{2P_k}{R_c}} = 0,154\ A$

$I_{cm} = I_{ctm} \cdot f_1(\Theta) \Rightarrow I_{ctm} = \frac{I_{cm}}{f_1(\Theta)} = 0,308\ A$

$P_{cc} = U_{cc} \cdot I_{cs} = U_{cc} \cdot I_{ctm} \cdot f_0(\Theta) = 3,31\ W$

$\eta = \frac{P_k}{P_{cc}} = 43,3\ \%$

25

$P_k = 100\,W$

$R_p = 50\,\Omega$

$n_1 : n_3 = 1:3$

$U_s = 2{,}65\,V$

$$R_c = \frac{n_1^2}{n_2^2} \cdot R_p = 5{,}55\,\Omega$$

$$P_k = \frac{U_{cm}^2}{2R_c} \Rightarrow U_{cm} = \sqrt{2 P_k R_c} = 33{,}33\,V$$

$$U_{cc} = U_{cm} + U_s = 36\,V$$

$$U_{cmax} = U_{cc} + U_{cm} = 69{,}33\,V$$

$$I_{cm} = \sqrt{\frac{2P_k}{R_c}} = 6\,A$$

$$I_{ctm} = \frac{I_{cm}}{F_1(\Theta)} = \frac{6}{0{,}5} = 12\,A$$

$$P_{cc} = U_{cc} \cdot I_{cs} = U_{cc}\, I_{ctm} \cdot F_0(\Theta) = 36 \cdot 12 \cdot 0{,}318$$

$$P_{cc} = 137{,}37\,W$$

$$\eta = \frac{P_k}{P_{cc}} = 72{,}8\,\%$$

(26) $P_k = 300\ W$

$f = 13{,}56\ MHz$

$U_{DD} = 75\ V$

$r_{DS(u)} = 0{,}085\ \Omega$

$C_0 = 500\ pF$

zanemarenj gubici $\rightarrow r_{DS(u)} = 0$

$$P_k = \frac{2}{\pi^2} \frac{R_p U_{DD}^2}{(R_p + r_{DS(u)})^2} \Rightarrow R_p = \frac{2}{\pi^2} \frac{U_{DD}^2}{P_k} = 3{,}8\ \Omega$$

$$I_{dtm} = \frac{2 U_{DD}}{\pi R_p} = 12{,}56\ A$$

$P_{d1} = P_{d2} = P_d / 2$

$P_d = P_{DD} - P_k + P_{d+}$ → gubitci na dotoku (zbog C_0)

$$P_d = \frac{2}{\pi^2} U_{DD}^2 \frac{r_{DS(u)}}{(R_p + r_{DS(u)})^2} + 4 C_0 U_{DD}^2 \cdot f$$

$P_d = 158{,}97\ W$

$P_{d1} = P_{d2} = 79{,}48\ W$

$$\eta = \frac{P_k}{P_{DD}} = \frac{P_k}{P_k + P_d} = 65{,}36\ \%$$

$f' = 1{,}3\ MHz$

$P_d' = 21\ W$

$$\eta = \frac{P_k}{P_k + P_d'} = 93{,}45\ \%$$

27.

$P_k = 28,6\ dBm = 0,724\ W$

$G = 9\ dB = 7,94$

$PAE = 75,6\ \%$

$$PAE = \frac{P_p - P_{wl}}{P_0} = \frac{P_k}{P_{cc}}\left(1 - \frac{1}{G}\right)$$

$$P_{cc} = \frac{P_k}{PAE}\left(1 - \frac{1}{G}\right) = \frac{0,724}{0,756}\left(1 - \frac{1}{7,94}\right) = 0,837\ W$$

$$P_{wz} = P_k - G = 28,6 - 9 = 19,6\ dBm = 91,2\ mW$$

$$\eta = \frac{P_k}{P_{cc}} = \frac{0,724}{0,837} = 86,5\ \%$$

(28)

$$P_K = \frac{8}{\pi^2} \frac{R_p \cdot U_{DD}^2}{(R_p + r_{DS(ON)})^2} \rightarrow \text{nije zadan} \Rightarrow = 0$$

$$P_K \approx \frac{8}{\pi^2} \frac{U_{DD}^2}{R_p}$$

$$U_{DD} = \sqrt{\frac{\pi^2}{8} P_K R_p} = 78{,}53\ V$$

$$U_{dm} = 2U_{DD} = 157\ V > U_{DSS} \quad -$$

$$I_{dm} = I_{Rm} = \frac{4U_{DD}}{\pi R_p} = 2A < I_{Dmax} \quad \checkmark$$

29) Klasa D -> oba pojačala rade kao sklopka

$P_k = \frac{1}{2} I_{km}^2 \cdot R_p = (U_{cc} - U_s) \cdot I_{cc}$

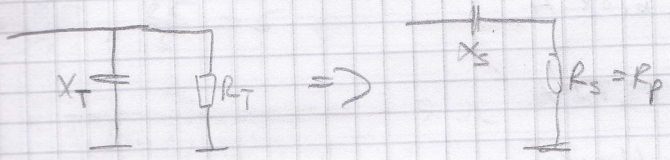
$I_{cc} = \frac{P_k}{U_{cc} - U_s} = 1{,}25\ A$

$I_{cc} = 0{,}577 \frac{U_{cc} - U_s}{R_p} \Rightarrow R_p = 0{,}577 \frac{U_{cc} - U_s}{I_{cc}} = 2{,}38\ \Omega$

$\frac{1}{X_{C1}} = \omega C_1 = \frac{0{,}184}{R_p} \Rightarrow C_1 = \frac{0{,}184}{2\pi f R_p} = 56{,}6\ pF$

$f' = 2f = 140\ MHz$ $\quad X'_{C2} = X_{L2}$

$f = 70\ MHz$ $\quad X_{C2} = 4 X_{L2}$



$X_T = -X_{C2} + X_{L2} = -3 X_{L2}$

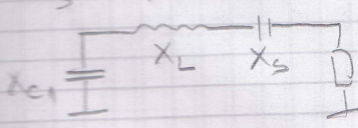
$X_S = \frac{R_T^2 \cdot X_T}{R_T^2 + X_T^2}$ $\quad$ $R_p = \frac{R_T X_T^2}{R_T^2 + X_T^2}$ (50 Ω)

$X_T^2 \cdot R_p + R_p R_T^2 = R_T X_T^2 \Rightarrow X_T = \sqrt{\frac{R_p \cdot R_T^2}{R_T - R_p}} = 20{,}8\ \Omega$

$|X_T| = |3 X_{L2}| \Rightarrow X_L = 6{,}93\ \Omega \Rightarrow L_2 = 15{,}77\ mH$

$|X_{C2}| = |4 X_{L2}| = 27{,}74 \Rightarrow C_2 = 82\ pF$

$X_S = 17{,}73\ \Omega$



$\Rightarrow \omega L - \frac{1}{\omega C_2} = 1{,}152 R_p$

$L = \frac{1{,}152 R_p + X_S}{\omega} = 59{,}64\ mH$

$P_c = U_s \cdot I_{cc} = 2{,}5\ W$

$\eta = \frac{P_k}{P_k + P_{duty}} = 88{,}89\ \%$

$I_{stm} = 2{,}862\, I_{cc} = 3{,}577\ A$

$U_{cmax} = U_s + 1{,}134 \cdot \pi (U_{cc} - U_s) = 39\ V$

(30)

$$\eta = \frac{R_p}{R_p + 1{,}365 \cdot r_{DS(w)}} \Rightarrow r_{DS(w)} = \frac{\frac{R_p}{\eta} - R_p}{1{,}365} = 0{,}2\ \Omega$$

$$\omega C_1 = \frac{0{,}184}{R_p} \rightarrow C_1 = \frac{0{,}184}{2\pi f R_p} = 697\ pF$$

$$C_p = C_1 - C_{DSS} = 572\ pF$$

$$\omega L_s = \frac{1}{\omega C_1} = 1{,}152\ R_p \Rightarrow L_s = \frac{1{,}152\ R_p - \frac{1}{\omega C_1}}{\omega} = 10$$

$$I_{DD} = 0{,}577\ \frac{U_{DD}}{R_p}$$

$$P_k = 0{,}577\ \frac{R_p\ U_{DD}^2}{(R_p + r_{DS(w)})^2} \Rightarrow U_{DD} = \sqrt{\frac{P_k (R_p + r_{DS(w)})^2}{0{,}577 R_p}} = 18{,}5\ V$$

$$I_{DD} = 0{,}577\ \frac{U_{DD}}{R_p} = 6{,}88\ A$$

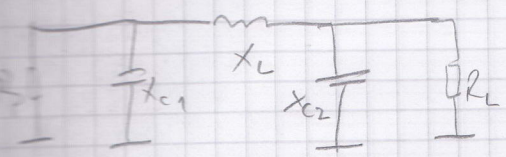
$$I_{dtm} = 2{,}862\ I_{DD} = 19{,}71\ A$$

$$U_{Dmax} = 1{,}134 \cdot \pi\ \frac{U_{DD} \cdot R_p}{R_p \cdot r_{DS(w)}} = 58{,}37\ V$$

(1) $P_c = \frac{8}{\pi^2 R_c} (U_{cc} - U_s)^2$

$R_c = \frac{8}{\pi^2 R_c} (U_{cc} - U_s)^2 = 100\ \Omega$

$R_c = \frac{2_0^2}{R_p} \Rightarrow R_p = \frac{2_0^2}{R_c} = 25\ \Omega$



T DENEROPOL

$X_{C1} = 5\ \Omega$

$Q = \frac{R_p}{X_{C1}} = \frac{25}{5} = 5$

$X_{C2} = \frac{R_L}{\sqrt{\frac{R_L}{R_p}(1+Q^2) - 1}} = 7\ \Omega \Rightarrow C_2 = 2,52\ nF$

$X_L = \frac{R_p}{1+Q^2}\left(Q + \sqrt{\frac{R_L}{R_p}(1+Q^2) - 1}\right) = 11,67\ \Omega \Rightarrow L = 206\ nH$

$V_{CEVmin} = 2U_{cc} - U_s = 62\ V$

$I_{ctM} = 2I_{c1M} = \frac{8}{\pi R_c}(U_{cc} - U_s) = 0,764\ A$

$\eta = \frac{P_{Rc}}{P_{Rc} + P_d} \qquad P_d = P_c + P_{ct}$

$P_d = \frac{8}{\pi^2 R_c}(U_{cc} - U_s)U_s + 2C_0 f (U_{cc} - U_s)^2 = 0,486 + 0,324 = 0,81\ W$

$\eta = \frac{7,3}{7,3 + 0,81} = 90\ \%$

$$P_k = \frac{8 U_{DD}^2}{\pi^2} \frac{R_d}{(R_d + 2 r_{DS(ON)})^2} = 6,859 \text{ W}$$

$$U_{dmax} = 2 U_{DD} = 64 \text{ V}$$

$$I_{dtm} = 2 I_{dAVmax} = \frac{8 U_{DD}}{\pi} \frac{1}{R_d + 2 r_{DS(ON)}} = 0,74 \text{ A}$$

$$\eta = \frac{P_k}{P_k + P_d}$$

$$P_d = 0,686 + 0,368 = 1,05 \text{ W}$$

$$= P_D + P_{D+} = \frac{8 U_{DD}^2}{\pi^2} \frac{2 r_{DS(ON)}}{(R_d + 2 r_{DS(ON)})^2} + 2 C_{DSS} f U_{DD}^2$$

$$\eta = \frac{6,86}{6,86 + 1,05} = 86,6 \%$$