

REŠENJA:

1. a) $I_{C4} = I_{C3} = \frac{V_{CC} - V_{EE} - V_{BE}}{R_1} = 1\text{mA}$; $I_{C1} = I_{C2} = 0,5\text{mA}$; $V_I = -2,5\text{V} = V_{EE} + R_2 I_{C2} \Rightarrow R_2 = 5\text{k}\Omega$;
 b) $g_{m1} = g_{m2} = \frac{I_1}{V_T} = 20\text{mS}$; $A_d = \frac{v_i}{v_{u1} - v_{u2}} = \frac{g_{m2} R_2}{2} = 50$;
 c) $A_s \cong -\frac{R_2}{2r_{ce4}}$; $\rho = \left| \frac{A_d}{A_s} \right| \cong g_{m2} r_{ce4} = 1000$.

2. Beleške za predavanja, Povratna sprega, slajdovi 9, 10 i 11.

3. Beleške za predavanja, 13_Regulator_(stabilizator)_napona.pdf, slajdovi 2, 3 i 5.

$$V_+ = V_Z = 5\text{V}; \quad V_- = (V_I)_{\text{nom}} \frac{R_1}{R_1 + R_2}$$

$$V_- = V_+ \Rightarrow (V_I)_{\text{nom}} = V_Z (R_1 + R_2) / R_1$$

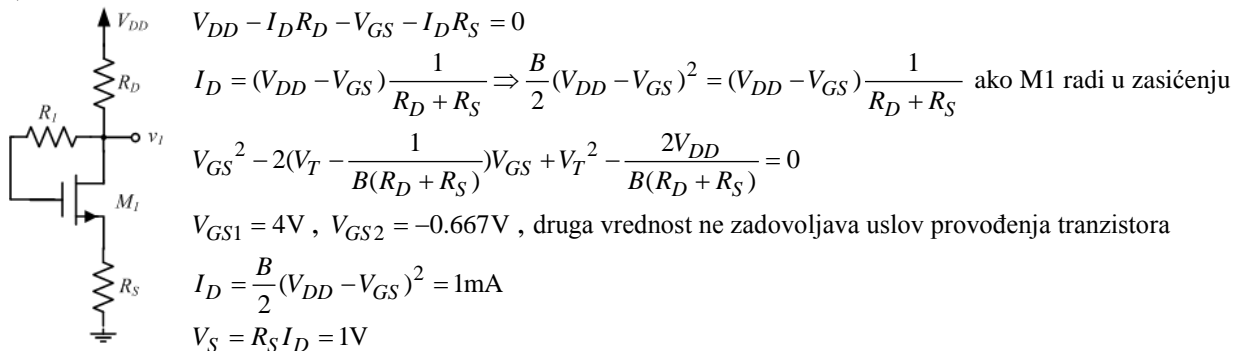
$$\text{Za } V_Z = 5\text{V}, \quad R_1 = 10\text{k}\Omega, \quad R_2 = 2\text{k}\Omega: \quad (V_I)_{\text{nom}} = 6\text{V}.$$

$$(I_I)_{\text{max}} = V_{BE} / R_{SZ};$$

$$\text{Za } V_{BE} = 0,6\text{V}, \quad R_{SZ} = 2\Omega: \quad (I_I)_{\text{max}} = 300\text{mA}.$$

$$R_{p\text{min}} = (V_I)_{\text{nom}} / (I_I)_{\text{max}} = 6\text{V} / 300\text{mA} = 20\Omega.$$

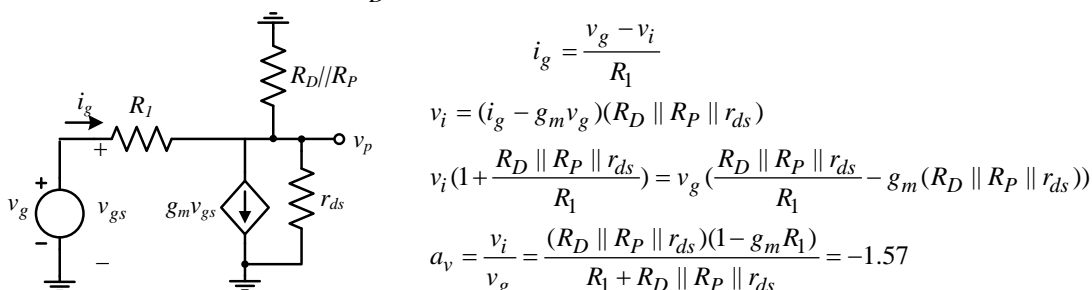
4. a)



$$V_G = V_S + V_{GS} = 5\text{V}$$

$$V_D = V_G = 5\text{V}$$

b) $g_m = \sqrt{2I_D B} = 1\text{mS}$, $r_{ds} = \frac{1}{\lambda I_D} = 100\text{k}\Omega$



c) $R_u = \frac{v_g}{i_g} = \frac{v_g}{v_g - v_i} R_1 = \frac{v_g}{v_g(1 - a_v)} R_1 = \frac{R_1}{(1 - a_v)} = 1.94\text{k}\Omega$

$$R_i = R_D \parallel R_1 \parallel r_{ds} = 2.44\text{k}\Omega$$

5.

$$v_X = -\frac{v_U}{R}R = -v_U$$

$$\text{a) } \frac{v_X}{R_X} + \frac{v_X - v_I}{R} - \frac{v_U}{R} = 0 \Rightarrow v_I = -\left(2 + \frac{R}{R_X}\right)v_U$$

$$a = \frac{v_I}{v_U} = -\left(2 + \frac{R}{R_X}\right)$$

$$\text{b) } v_{I \min} = V_{EE} = -\left(2 + \frac{R}{R_{X \min}}\right)V_m \Rightarrow R_{X \min} = \frac{R}{-\frac{V_{EE}}{V_m} - 2} = 5\text{k}\Omega$$

c)

