

## REŠENJA:

1. Beleške za predavanja, „2\_Dioda.pdf“, slajdovi 37 i 39.

$$a) v_p = (240 \cdot \sqrt{2}/10) - V_D = 240 \cdot \sqrt{2}/10 ;$$

$$b) V_p = \frac{2}{\pi} (24 \cdot \sqrt{2}) V .$$

2. Beleške za predavanja, „7\_Strujni\_izvori\_i\_aktivno\_opterecenje.pdf“, slajd 4.

$$I_{IZL} R_E = 100 \text{mV} = V_T \ln \left( \frac{I_{REF}}{I_{IZL}} \right) = (25 \text{mV}) \ln \left( \frac{1 \text{mA}}{I_{IZL}} \right)$$

$$4 = \ln \left( \frac{1 \text{mA}}{I_{IZL}} \right) \Rightarrow \frac{1 \text{mA}}{I_{IZL}} = e^4 = 54,59815 \Rightarrow I_{IZL} = \frac{1 \text{mA}}{54,59815}$$

$$R_E = \frac{100 \text{mV}}{I_{IZL}} = 54,59815 \frac{100 \text{mV}}{1 \text{mA}} = 5,45981 \text{k}\Omega$$

3. Beleške za predavanja, „9\_Izlazni\_pojacavacki\_stepeni.pdf“, slajdovi 6-8.

4.

$$a) \text{ i b) } V_E = (R_{E1} + R_{E2}) I_C = 5 \text{V}$$

$$V_C = V_E + V_{CE} = 10 \text{V}$$

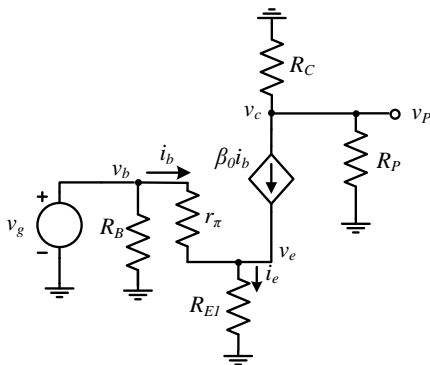
$$V_C = V_{CC} - R_C I_C \Rightarrow R_C = \frac{V_{CC} - V_C}{I_C} = 4 \text{k}\Omega$$

$$V_B = V_E + V_{BE} = 5,6 \text{V}$$

$$V_B = \frac{R_2}{R_1 + R_2} V_{CC} \Rightarrow R_2 = \frac{R_1}{\frac{V_{CC}}{V_B} - 1} = 87,5 \text{k}\Omega$$

$$V_P = 0$$

$$c) r_\pi = \frac{\beta_0 V_T}{I_C} = 5 \text{k}\Omega, R_B = R_1 \parallel R_2 = 46,67 \text{k}\Omega$$



$$\left. \begin{aligned} v_p &= -\beta_0 i_b (R_C \parallel R_P) \\ i_b &= \frac{v_g}{r_\pi + (1 + \beta_0) R_{E1}} \end{aligned} \right\} \Rightarrow v_p = -\frac{\beta_0 (R_C \parallel R_P)}{r_\pi + (1 + \beta_0) R_{E1}} v_g \Rightarrow a_v = \frac{v_p}{v_g} = -\frac{\beta_0 (R_C \parallel R_P)}{r_\pi + (1 + \beta_0) R_{E1}} = -5,2$$

$$R_i = R_C = 4 \text{k}\Omega$$

$$R_u = R_B \parallel (r_\pi + (1 + \beta_0) R_{E1}) = 25,35 \text{k}\Omega$$

$$\left. \begin{aligned} i_p &= \frac{v_p}{R_p} \\ i_g &= \frac{v_g}{R_u} \end{aligned} \right\} \Rightarrow a_i = \frac{i_p}{i_g} = \frac{R_u}{R_p} \frac{v_p}{v_g} = \frac{R_u}{R_p} a_v = -22.82$$

$$d) v_B(t) = V_B + v_b(t) = V_B + v_g(t) = (5.6 + 0.5 \sin(2\pi ft))V$$

$$v_C(t) = V_C + v_c(t) = V_C + a_v v_g(t) = (10 - 2.6 \sin(2\pi ft))V$$

$$v_P(t) = V_P + v_p(t) = a_v v_g(t) = -2.6V \sin(2\pi ft)$$

$$v_E(t) = V_E + v_e(t) = V_E + (1 + \beta_0) R_{E1} i_b(t) = V_E + \frac{(1 + \beta_0) R_{E1}}{r_\pi + (1 + \beta_0) R_{E1}} v_g(t) = (5 + 0.91 \sin(2\pi ft))V$$

5. a)

Jednosmerni režim:

$$V_B = \frac{V_{CC}}{2} = V_A = 2.5V$$

$$V_C = V_A + \frac{V_A - V_G}{R} 2R = 3V_A - 2V_G = -0.5V$$

$$V_I = 0$$

Naizmenični režim:

$$v_b = v_a = 0$$

$$v_c = -2v_g = v_i$$

Ukupan signal:

$$v_A(t) = V_A + v_a(t) = 2.5V$$

$$v_B(t) = V_B + v_b(t) = 2.5V$$

$$v_C(t) = V_C + v_c(t) = -(0.5V + 0.4 \sin 2\pi ft)V$$

$$v_I(t) = V_I + v_i(t) = -0.4 \sin 2\pi ftV$$

b)  $-5V \leq v_C(t) \leq 5V$  da operacioni pojačavač ne bi ušao u zasićenje

$$v_{g \max} = \frac{V_C - v_{c \min}}{2} = 2.25V$$

$$v_{g \min} = \frac{V_C - v_{c \max}}{2} = -2.75V$$

$$V_m = \min \{ v_{g \max}, -v_{g \min} \} = 2.25V$$