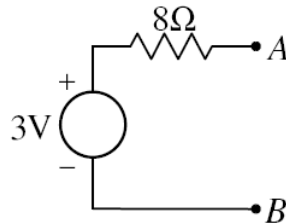


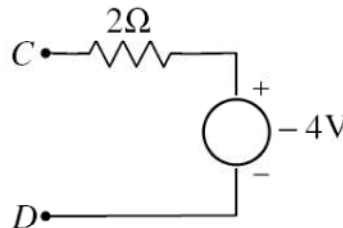
REŠENJA

1.

a) $U_{TEV1} = 3V$; $R_{TEV1} = 8\Omega$.



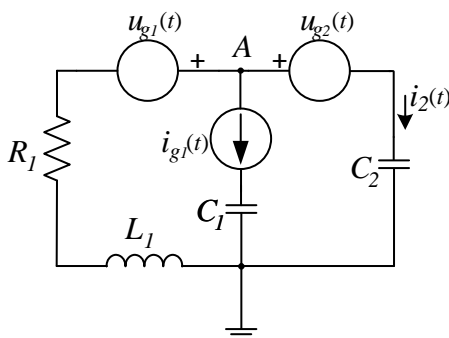
b) $U_{TEV2} = -4V$; $R_{TEV} = 2\Omega$.



c) $V_G = 5V$

2. $U_0 = 1V$

3. a) $\underline{V}_A = -j2V$



b) $i_2(t) = 2\sqrt{2}A \cos(2\pi ft)$

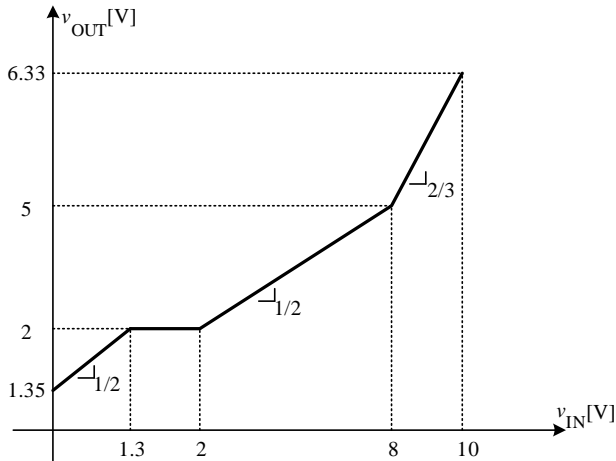
4.

I) $0 \leq v_{IN} < 1.3V$; $D_Z - ON, D_1 - OFF$; $v_{OUT} = \frac{1}{2}v_{IN} + 1.35V$

II) $1.3V \leq v_{IN} < 2V$; $D_Z - OFF, D_1 - OFF$; $v_{OUT} = 2V$

III) $2V \leq v_{IN} < 8V$; $D_Z - OFF, D_1 - ON$; $v_{OUT} = \frac{1}{2}v_{IN} + 1V$

IV) $8V \leq v_{IN} < 10V$; $D_Z - ON, D_1 - ON$; $v_{OUT} = \frac{2}{3}v_{IN} - \frac{1}{3}V$



6. a) Za kolo, pod prepostavkom da tranzistor radi u zasićenju, može se pisati:

$$I_D = \frac{k_n}{2} (V_{GS} - V_t)^2, V_{GS} = V_G - V_I = \frac{R_{G1}}{R_{G1} + R_{G2}} V_{DD} - V_I = 3 \text{ V}$$

odakle sledi da je struja drejna

$$I_D = 4 \text{ mA},$$

a tražena struja strujnog izvora

$$I_0 = I_D - \frac{V_I}{R_P} = 3 \text{ mA}.$$

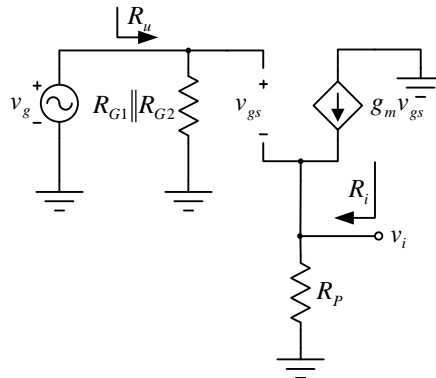
b) Na osnovu ekvivalentnog kola pojačavača za male signale prikazanog na slici 2 može se pisati

$$v_i / R_P - g_m v_{gs} = 0, v_{gs} = v_g - v_i,$$

odakle sledi

$$A_v = \frac{v_i}{v_g} = \frac{g_m R_P}{1 + g_m R_P}.$$

Ulazna otpornost kola sa slike 2 je jednaka $R_u = R_{G1} \parallel R_{G2}$.



Slika 2

Na slici 3 prikazano je ekvivalentno kolo za određivanje izlazne otpornosti. Na osnovu slike 3 se može pisati

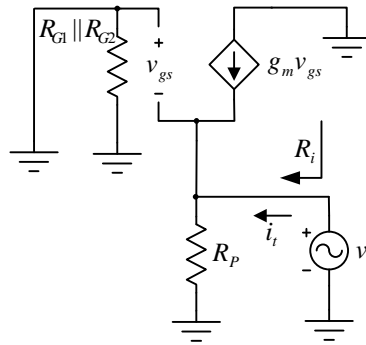
$$R_i = \frac{v_t}{i_t} = \frac{v_t}{-g_m v_{gs} + v_t / R_P}$$

S obzirom da je

$$v_{gs} = -v_t,$$

dobija se

$$R_i = \frac{R_P}{1 + g_m R_P}.$$



Slika 3

Strujno pojačanje pojačavača je

$$A_i = \frac{i_p}{i_g} = \frac{v_i/R_P}{v_g/R_u}$$

Kada se iskoriste ranije izvedeni izrazi za ulaznu otpornost i naponsko pojačanje pojačavača, dobija se

$$A_i = \frac{v_i}{v_g} \frac{R_u}{R_P} = A_v \frac{R_u}{R_P}$$

c) Transkonduktansa tranzistora u mirnoj radnoj tački je

$$g_m = \sqrt{2k_n I_D} = 8 \text{ mS},$$

a vrednosti parametara pojačavača su

$$A_v = 0.97, R_u = 21 \text{ k}\Omega, R_i = 121 \Omega, A_i = 5.1.$$