Zadatak 1.

$$U_{sm} = \frac{U_{ulm}}{n} = \frac{330}{10} = 33V$$

$$U_{izm} = -33V$$

$$r = \frac{U_{izef}}{|U_{iz}|} = \frac{|U_{izm}|}{4\sqrt{3}fR_TC}$$

$$C = 724\ \mu F$$

$$U_{iz} = -32{,}9\ V$$

Zadatak 2.

a) $r_d = 333\ \Omega \neq \infty$ → točka A nalazi se u triodnom području rada

b) $g_m = \frac{\mu}{r_d} = 6\ \mathrm{mA/V}$

$g_m = K \cdot U_{DS}$ → $U_{DS} = \frac{g_m}{K} = 2V$

$g_d = \frac{1}{r_d} = \frac{\partial I_D}{\partial U_{DS}} = K(U_{GS} - U_{GS0} - U_{DS})$

$U_{GS0} = U_{GS} - 3$

$I_{DB} = K(1{,}5U_{GS} - U_{GS0} - \frac{U_{DS}}{2}) \cdot U_{DS}$

→ točka B nalazi se u triodnom području rada ($I_{DB} > I_{DB},\ U_{DS} = konst.$)

$24 = 3(1{,}5U_{GS} - U_{GS0} - 1) \cdot 2$

$U_{GS} = 4V$

$U_{GS0} = 1V$

c) $U_{GS0} > 0\ V$ → Obogaćeni *n* MOSFET

d) $I_{DAmax} = I_{DAzas} = \frac{K}{2}(U_{GS} - U_{GS0})^2 = 13{,}5\ \mathrm{mA}$

Zadatak 3.

(a)

$$U_{GG} = \frac{R_2}{R_1 + R_2} U_{DD} = 2,4 \text{ V} \qquad U_{GG} = U_{GSQ} + I_{DQ}\left(R_{S1} + R_{S2}\right) \text{ i } I_{DQ} = \frac{K}{2}\left(U_{GSQ} - U_{GS0}\right)^2$$

$$\rightarrow U_{GSQ}^2 - 2\left(U_{GS0} - \frac{1}{K\left(R_{S1} + R_{S2}\right)}\right)U_{GSQ} + U_{GS0}^2 - \frac{2U_{GG}}{K\left(R_{S1} + R_{S2}\right)} = 0$$

$$U_{GSQ}^2 - 1,6U_{GSQ} + 0,04 = 0 \quad \rightarrow \quad U_{GSQ} = 0,8 \pm 0,775 = \begin{cases} \boxed{1,575 \text{ V}}, \text{ jer mora biti } U_{GSQ} > U_{GS0} \\ \cancel{0,025 \text{ V}} \end{cases}$$

$$I_{DQ} = \frac{K}{2}\left(U_{GSQ} - U_{GS0}\right)^2 = \boxed{0,827 \text{ mA}} \quad U_{DSQ} = U_{DD} - I_{DQ}\left(R_D + R_{S1} + R_{S2}\right) = \boxed{7,044 \text{ V}}$$

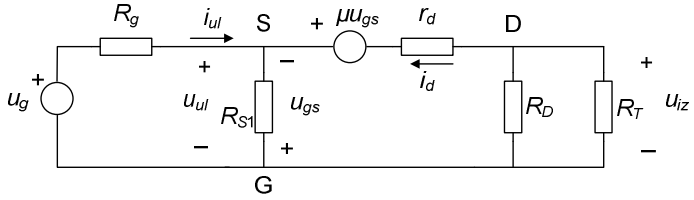
$U_{DSQ} > U_{GSQ} - U_{GS0} \rightarrow$ zasićenje OK!

$$g_m = \left.\frac{\partial I_D}{\partial U_{GS}}\right|_Q = K\left(U_{GSQ} - U_{GS0}\right) = \boxed{2,875 \text{ mA/V}}, \text{ * ili } g_m = \left.\frac{\partial I_D}{\partial U_{GS}}\right|_Q = K\left(U_{GSQ} - U_{GS0}\right)\left(1 + \lambda U_{DSQ}\right) = \boxed{3,037 \text{ mA/V}}$$

$$r_d = \left.\frac{\partial U_{DS}}{\partial I_D}\right|_Q = \frac{1}{\lambda I_{DQ}} = \boxed{151 \text{ k}\Omega}$$

$$\mu = g_m r_d = \boxed{434} \quad \text{* ili} \quad \boxed{459}$$

(b)



$$A_V = \frac{u_{iz}}{u_{ul}} = \frac{u_{iz}}{i_d}\frac{i_d}{u_{ul}}$$

$$u_{iz} = -i_d\left(R_D \parallel R_T\right) \quad \rightarrow \quad \frac{u_{iz}}{i_d} = -\left(R_D \parallel R_T\right)$$

$$u_{ul} = -u_{gs} \quad \text{i} \quad i_d\left(r_d + R_D \parallel R_T\right) - \mu u_{gs} - u_{gs} = 0 \quad i_d\left(r_d + R_D \parallel R_T\right) = -\left(1 + \mu\right)u_{ul} \quad \rightarrow \quad \frac{i_d}{u_{ul}} = \frac{-\left(1 + \mu\right)}{r_d + R_D \parallel R_T}$$

$$A_V = \frac{\left(1 + \mu\right)\left(R_D \parallel R_T\right)}{r_d + R_D \parallel R_T} = \boxed{9,394} \qquad \text{* ili} \quad \boxed{9,934}$$

(c)

$$R_{ul} = \frac{u_{ul}}{i_{ul}} = R_{S1} \parallel \frac{u_{ul}}{-i_d} = R_{S1} \parallel \left[\frac{r_d + R_D \parallel R_T}{1 + \mu}\right] = \boxed{208 \ \Omega} \qquad \text{* ili} \quad \boxed{201 \ \Omega}$$