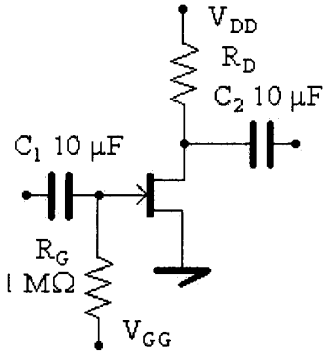
Baskent University, Faculty of Engineering
BME 222-02 – Electronics (Spring Semester 2004/2005)
Quiz 3 – May 20, 2005

Student Name_____

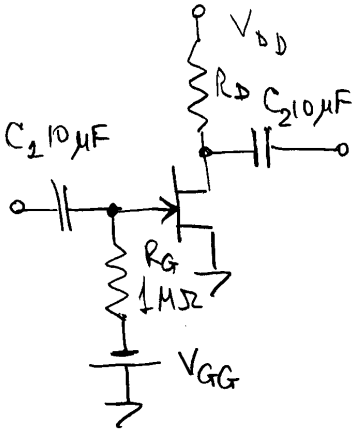
Faculty No: _____



For the network of Figure determine $\mathbf{V_{DSQ}}$, $\mathbf{V_{GG}}$ and $\mathbf{R_D}$. Given the information $\mathbf{V_P = -8\ V}$, $\mathbf{I_{DSS} = 16\ mA}$, $\mathbf{I_{DQ} = 4\ mA}$, $\mathbf{V_{DD} = 12\ V}$ and $\mathbf{V_D = 6\ V}$.

5 points.

Good Luck!



For the network of Figure determine V_{DS}, V_{GG}, R_D. Given the information $V_p = -8V$, $I_{DSS} = 16mA$ and $I_{DQ} = 4mA$, $V_{DD} = 12V$, $V_D = 6V$

Solution:

1. Using parameters listed above, the gate-to-source voltage can be defined from Shockley equation

$$I_{DQ} = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2$$

$$\left(1 - \frac{V_{GS}}{V_P}\right)^2 = \frac{I_{DQ}}{I_{DSS}}$$

$$1 - \frac{V_{GS}}{V_P} = \sqrt{\frac{I_{DQ}}{I_{DSS}}}$$

$$V_{GS} = V_P\left(1 - \sqrt{\frac{I_{DQ}}{I_{DSS}}}\right) = -8\left(1 - \sqrt{\frac{4\cdot10^{-3}}{16\cdot10^{-3}}}\right) = -8\left(1 - \frac{1}{2}\right) = \underline{-4V}$$

And from this $V_{GG} = +V_{GS} = \underline{-4V}$

2. Drain resistor can be defined from equation

$$V_{DS} = V_{DD} - I_D R_D$$

Because $V_{DS} = V_D = 6V$, resistance of R_D is

$$R_D = \frac{V_{DD} - V_{DS}}{I_D} = \frac{12-6}{4\cdot10^{-3}} = 1.5\,k\Omega$$