Date: December-10-2024

Tuesday, December 10, 2024 8:16 PM

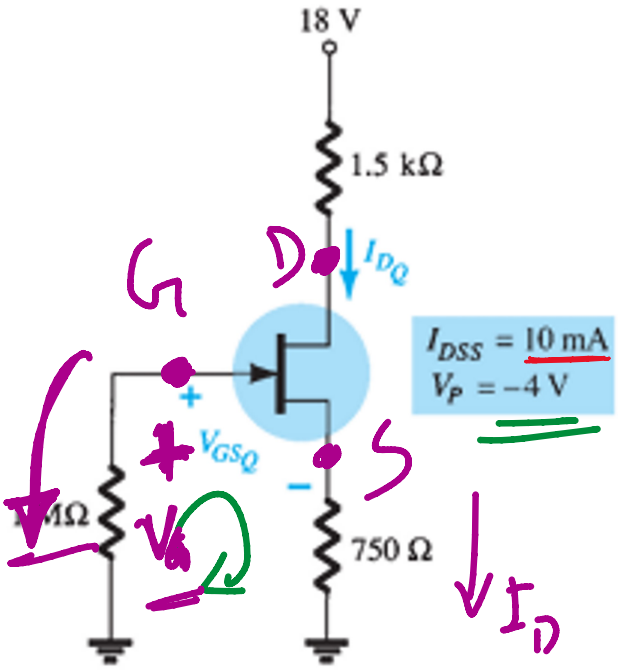


FIG. 7.80

Problems 6, 7, and 38.

$$I_G R_G + V_{GS} + I_D R_S = 0$$

$$\Rightarrow V_{GS} = -750 I_D$$

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

$$= 10\times10^{-3}\left(1 - \frac{750 I_D}{4}\right)^2$$

init value	I_D	V_{GS}
0	2.61 mA	−1.96
10m	0.011 A	−8.18

$I_D = 2.61$ mA

$V_{GS} = -1.96$ V

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

$$= 18 - \ldots$$

$$= 12.13\,V$$ Ans

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

$$= 14.085\,V$$ Ans

$$V_G = I_G R_G = 0\,V$$ Ans

$$V_S = I_D R_S = 1.958\,V$$ Ans

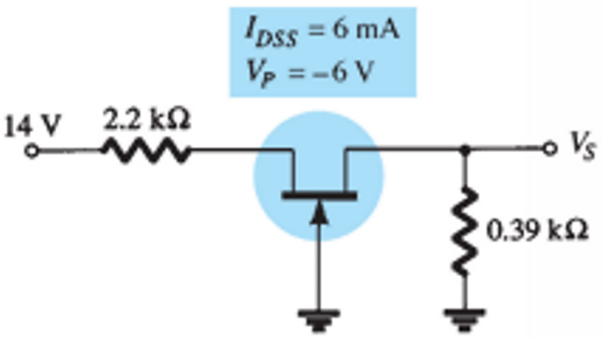
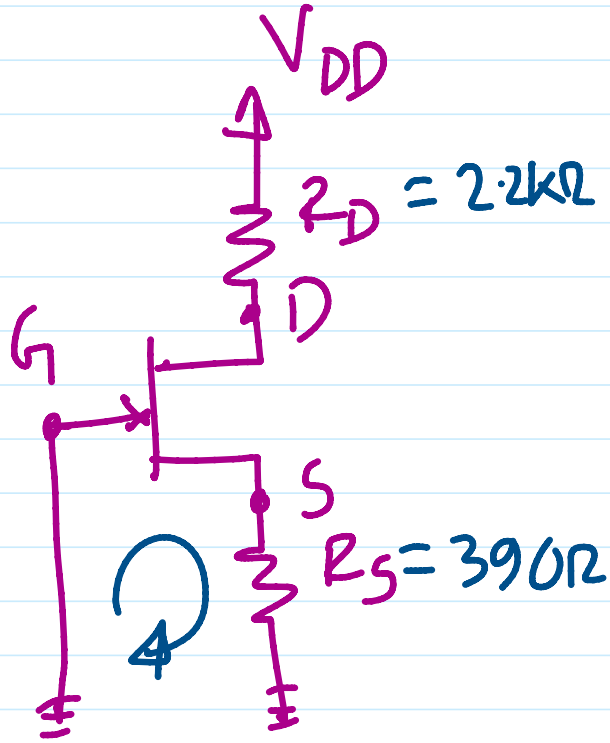


FIG. 7.84
Problem 11.



$$I_G R_G + V_{GS} + I_D R_S = 0$$

$$\Rightarrow V_{GS} = -390 I_D$$

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

$$= 6\times10^{-3}\left(1 - \frac{390 I_D}{6}\right)^2$$

$$\therefore \boxed{I_D = 3.55\text{mA} \rightarrow V_{GS} = -1.39\text{V}}$$

$V_s = I_D R_s =$

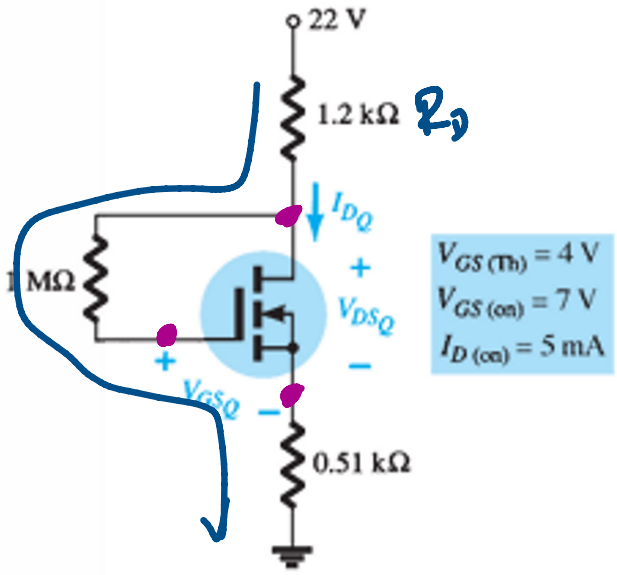


FIG. 7.94
Problem 22.

$22 = I_D R_D + V_{GS} + I_D R_s$

$\Rightarrow V_{GS} = 22 - I_D(R_D + R_s)$

$= 22 - I_D \times 1710$

$I_D = K(V_{GS} - V_{TH})^2$

$K = \dfrac{I_{DS(on)}}{(V_{GS(on)} - V_{TH})^2} = \dfrac{5 \times 10^{-3}}{(7-4)^2}$

$= \dfrac{5}{9}\ mA/V^2$

$I_D = \dfrac{5}{9} \times 10^{-3}(22 - 1710 I_D - 4)^2$

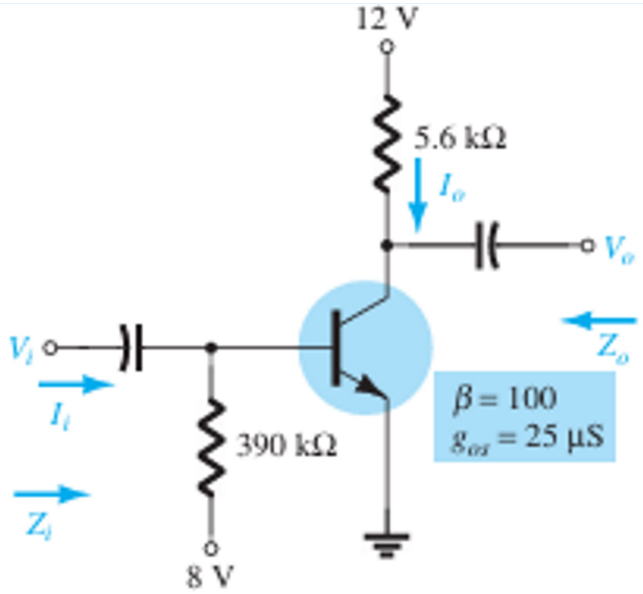
$I_D = \frac{5}{9} \times 10^{-3} (18 - 1710 I_D)^2$

$V_{DS} =$

$\Rightarrow I_D = 8.27\text{mA} \Rightarrow V_{GS} = 7.86\text{V}$

Ans

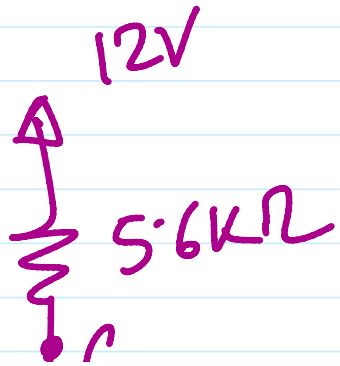
$I_D = 8.27\text{mA}$ Ans

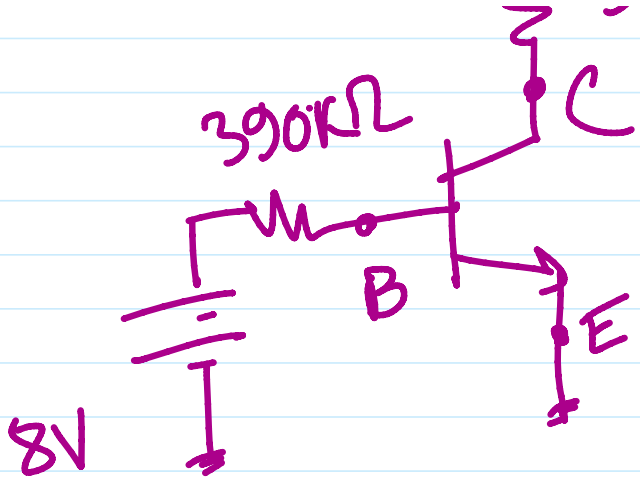


$r_o = \frac{1}{g_{os}} = 40\text{K}\Omega$

FIG. 5.153
Problem 13.

las





$$I_B = \frac{8 - 0.7}{390 \times 10^3}$$

$$= 18.72\,\mu A$$

$$I_E = (1+\beta) I_B = 1.89\,mA$$

$$r_e = \frac{V_T}{I_E} = \frac{26}{1.89} = 13.76\,\Omega$$

$$Z_i = R_B \| \beta r_e = 390 \times 10^3 \| 100 \times 13.76$$

$$= 1371.16\,\Omega$$ AN

$$Z_o = r_o \| R_C = 40 \times 10^3 \| 5.6 \times 10^3$$

$$= 4912.28\,\Omega$$ AN

$$A_v = -\frac{r_o \| R_c}{r_e} = -357$$ Av

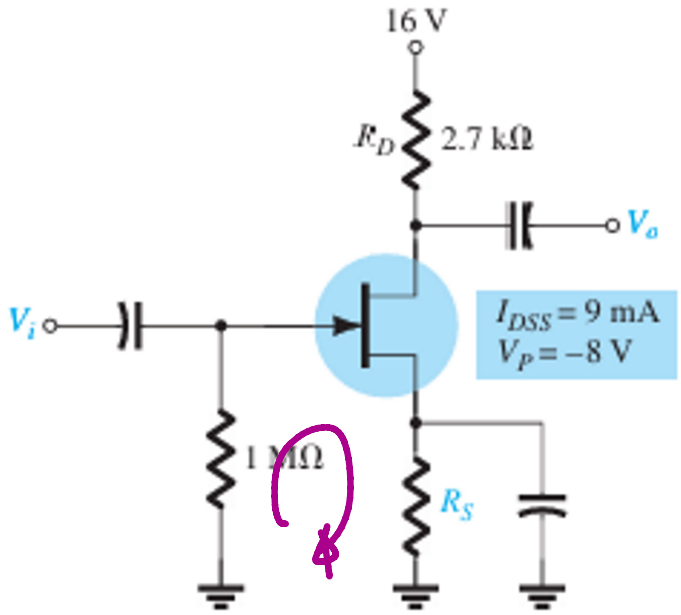


FIG. 8.74
Problem 23.

R_o
||
$A_v = -g_m Z_o$

$\Rightarrow -2 = -g_m \times 2.7 \times 10^3$

$\therefore g_m = 740.74 \times 10^{-6}$ A/V

$g_m = \frac{d I_D}{d V_{GS}}$

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

$$740.74 \times 10^{-6} = \frac{2 \times 9 \times 10^{-3}}{}\left(1 + \frac{V_{GS}}{8}\right)$$

$$\Rightarrow 740.74\times10^{-6} = \frac{2\times9\times10^{-3}}{8}\left(1+\frac{V_{GS}}{8}\right)$$

$$\Rightarrow V_{GS} = -5.37\,V$$

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

$$= 9\left(1-\frac{5.37}{8}\right)^2$$

$$= 0.973\,mA$$

$$\cancel{I_G}^{\,0}R_G + V_{GS} + I_D R_S = 0$$

$$\Rightarrow R_S = -\frac{V_{GS}}{I_D} = \frac{5.37}{0.973\times10^{-3}}$$

$$= 5519.01\,\Omega \quad \boxed{\Delta\Omega}$$

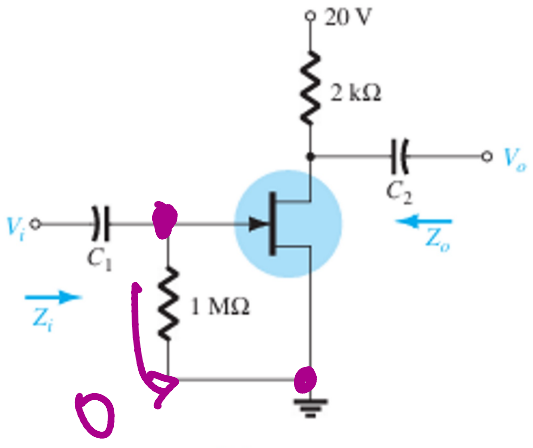


FIG. 8.75
Self-bias configuration for Problems 24 and 60.

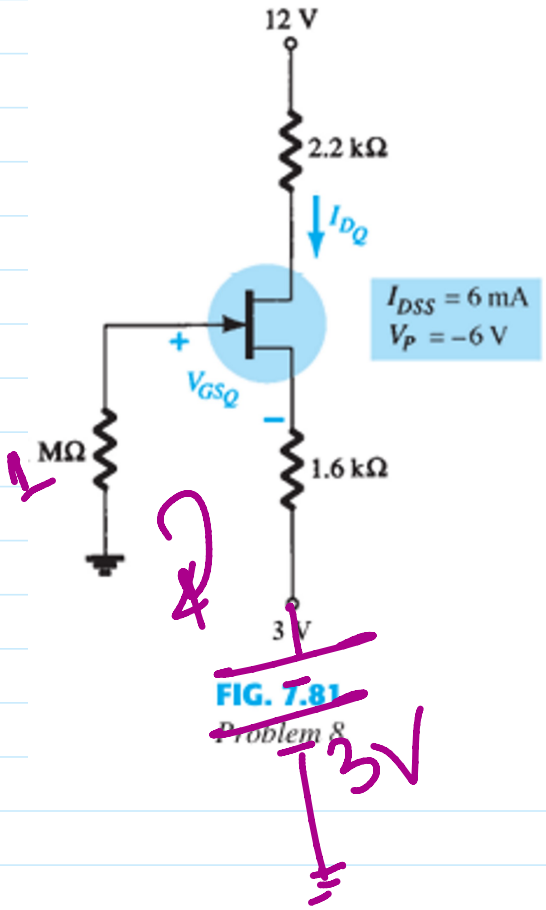


FIG. 7.81
Problem 8.

$I_D R_S + V_{GS} + I_D R_S + 3 = 0$

$V_{GS} = -3 - I_D R_S$

$I_D =$