Universidad Nacional autónoma de México

Facultad de Estudios Superiores Aragón

Ingeniería en computación

Dispositivos electrónicos

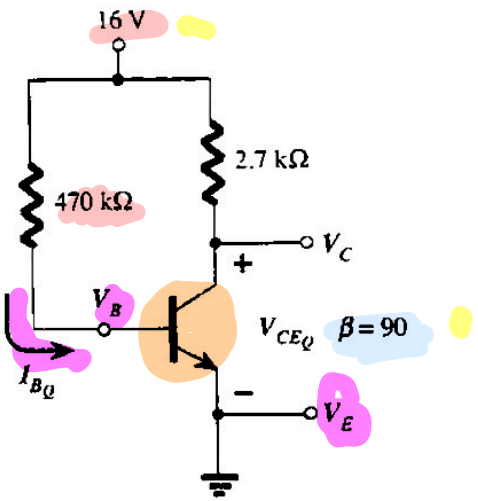
Series 2

Celis Alonso Neli Ximena

Profesor:Abel verde cruz

Grupo:2410

1. Para la configuración de polarización fija de la figura 4.75. detén



a) I_{BQ}

$$R_E = \frac{1}{\frac{1}{470} + \frac{1}{2.7K}}$$

$= 2.7K\,\Omega$

$V_{BE} = 0.7\,V$

$$I_{BQ} = \frac{V_{CC} - V_{BE}}{R_B}$$

$$= \frac{16V - 0.7V}{470K\Omega} = \frac{15.3V}{470K\Omega} = 32.55\,\mu A$$

b) I_{CQ}

$I_{CQ} = \beta \cdot I$

$= (90)(32.55\,\mu A) = 2.93\,mA$

c) $V_{CEQ} = V_{CC} - I_{CQ} * R_C =$

$= 16\,V - (2.93\,mA)(2.7\,K\Omega) = 8.09\,V$

d) $V_C = V_{CEQ} = 8.09\,V$

e) $V_B = V_{BE} = 0.7\,V$

f) $V_E = 0\,V$

2. Dada la información que aparece en la figura 4.76. calcule:

a) $I_C = B \cdot I_B$

$= (80)(40\,\mu A) =$

$= 3.2\,mA$

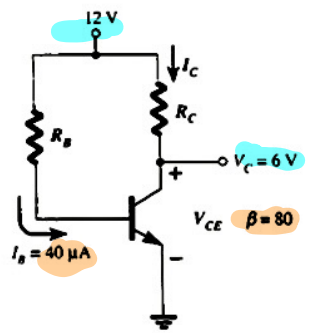


Figura 4.76 Problema 2.

b) $R_C = \frac{V_R}{I_C}$

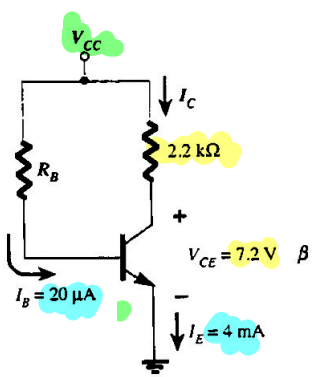
$= \frac{V_{CC} - V_C}{I_C}$

$= \frac{12V - 6V}{3.2mA} = \frac{6V}{3.2mA} = 1.8K\Omega$

c) $RB = \frac{VR}{IB} \quad \frac{VR - VBE}{Id}$

$= \frac{12V - 0.7V}{40NA} = \frac{11.3v}{40NA} = 282.5K\Omega$

3. Dada la información que aparece en la figura 4.77, determine:



a) $IC = IE - IB$

$4mA - 20\mu A = 3.98mA$

B) $VCC = VCE + Ic * Rc$

$= 7.2V + (3.98mA)(2.2K\Omega)$

$= 15.96V$

c) $\beta = \frac{IC}{IB} = \frac{3.98mA}{20NA} = 199$

d) $RB = \frac{VR}{IB} = \frac{VCC - VBE}{IB} \quad \frac{15.96V - 0.7V}{20NA} = 763K\Omega$

4. Para la configuración de polarización por divisor de voltaje de la figura 4.82. determine:

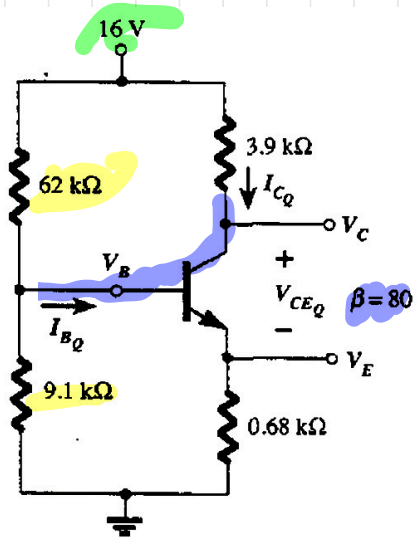


Figura 4.82 Problemas 12, 15, 18,

a) I_{BQ}

R_{Th}

$R_{Th} = R_1 \| R_2 = 62K\Omega \| 9.1K\Omega = 7.93\ K\Omega$

V_{Th}

$$V_{Th} = \frac{R_2 * V_{CC}}{R_1 + R_2} = \frac{(9.1K\Omega)(16V)}{9.1K\Omega + 62K\Omega} = 2.05V$$

$$I_{BQ} = \frac{V_{Th} - V_{BE}}{R_{Th} + (\beta+1) R_E}$$

$$= \frac{2.05V - 0.7V}{7.94K\Omega + (80)(0.68K\Omega)}$$

$$= 21.42\mu A$$

b) $I_{CQ} = B * I_{BQ}$

$= 80\,(21.42\mu A) = 1.7\,mA$

c) $V_{CEQ} = V_{CC} - I_C(R_C + R_E)$

$= -16V - (1.71mA)(3.9K\Omega + 0.68K\Omega)$

$= 8.17V$

d) $U_C = V_C - I_C * R_C =$

$16V - (1.71mA)(3.9K\Omega) = 9.33V$

e) $U_E = I_E * R_E \simeq I_C * R_E$

$(1.71mA)(0.68) = 1.16V$

f) $V_E = V_E + V_{EE}$

$1.16V + 0.7V = 1.86V$

5. Para la configuración de polarización fija de la figura 6.67:
a) Trazar las carácterstica de transferencia del dispositivo.
b) Sobreponer la ecuación de la red en la misma gráfica
c) Calcular IDQ y VDSQ
d) Con la ecuación Shockley, resuelva lo, luego localice YDSQ. Compare con las soluciones de inciso c.

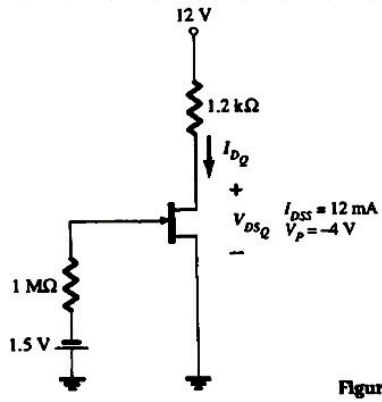
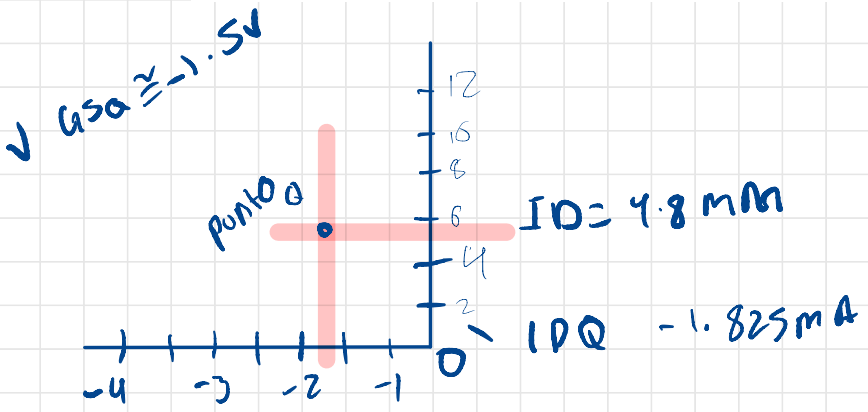


Figura 6.67 Problemas 1, 35, 38, 41. .



c) $I_{DQ} = 4.8\,mA$ y V_{GS} 1.5 V

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

$V_{GS} = -V_{GG} = -15\ V$

$V_{GS} = 9.5\ V$

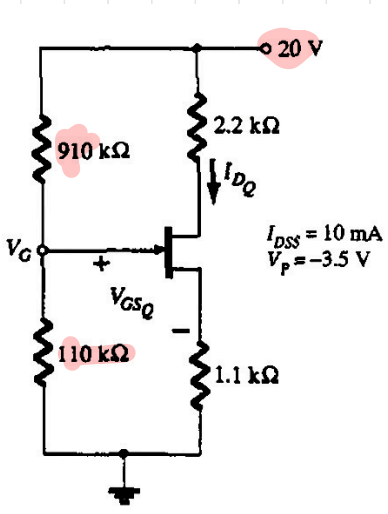
$I_D = (12m)\left(1 - \frac{(-9.5)}{(-4)}\right)^2 = 4.69\,mA$

LVK

$-12\ V + (9.2\ K)(4.69) + V_{DSQ} = 0$

$V_{DSQ} = 12 - 5.63\ V = 6.37\ V$

6. Determine para la red de la figura 6.77:



a) V_G

$V_G = \frac{R_2}{R_2 + R_1}(V_{CC})$

$= \frac{110\ K\Omega}{910K\Omega + 110K\Omega}(20V)$

$= 2.15\ V$

b) I_{DQ} y V_{GSQ}

$I_{DQ} = 3.2\,mA$

$V_{GS} = -1.5\,V$

c) malla V_D

$-20 + (2.2K)(3.2mA) + V_D = 0$

$V_D = 20 - (2.2K)(3.2\,mA) = 12.96V$

V_S

$V_S = I_D(R_S) =$

$(3.2\,mA)(1.1K) = 3.5V$

d) V_{DSQ}

$V_{DSQ} = V_D - V_S$

$= 12.96 - 3.52 = 9.44\,V$

7. Para la red de la figura 8.70:

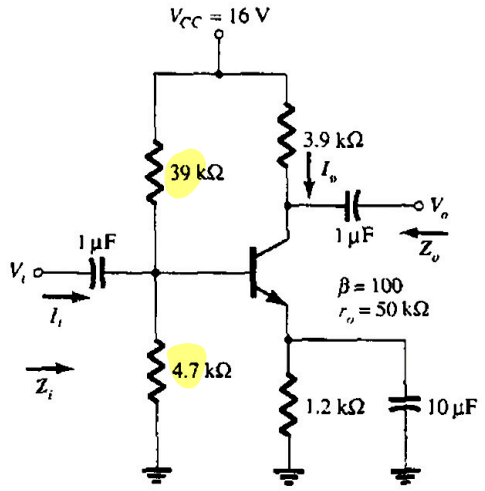


Figura 8.70 Problema 4.

a) Determina r

V_B

$$V_B = \frac{R_2}{R_1 + R_2}(V_{CC}) = \frac{4.7\,K\Omega}{39\,K\Omega + 4.7\,K\Omega}(16\,V)$$

$$V_B = 1.720\,V$$

V_Z

$$V_Z = V_B - V_{BE}$$
$$= 1.720\,V - 0.7\,V$$
$$= 1.02\,V$$

(IE)

$$I_E = \frac{V_E}{R_E} = \frac{1.02\,V}{1.2\,K\Omega} = 0.85\,mA$$

(re)

$$re = \frac{26\,mV}{I_E}$$

$$= \frac{26\,mV}{0.85\,mA} = 30.58\,\Omega$$

$$R_E = R_1 \,||\, R_2$$

$$= \frac{1}{\frac{1}{39K\Omega} + \frac{1}{4.7K\Omega}} = 4.19\,K\Omega$$

b) Encontrar Z_i Z_a

$$Z_1 = R \,||_\beta re$$

$$= (4.19\,K\Omega)\,||\,(100)\,(30.58\,\Omega)$$

$$= (4.19\,K\Omega)\,||\,(3.058 \times 10^3)$$

$$= 4.18\,K\,\Omega$$

c) Encontrar A_v y A

$$Av = \frac{-Re}{re} = \frac{5.9\,K\Omega}{30.58\,\Omega}$$

$$= -127.53$$

d) Repetir los incisos b y c cuando $r_o = 25\,K\Omega$

(2)

$$Z_1 = 4.18\,K\Omega$$

(20)

$$20 = Re \,||\, ro$$
$$= 3.9\,K\Omega \,||\, 25\,K\Omega$$

$$= \frac{1}{\frac{1}{3.9\,K\Omega} + \frac{1}{25\,K\Omega}} = 3.37\,K\Omega$$

(Av)

$$Av = \frac{-Re \,||\, ro}{re} = \frac{3.37\,K\Omega}{30.58\,\Omega} = 110.20$$

8. Para la red de la figura 8.78:Encontrar A, y Aj
a) Calcular IB e Ic
b) Determinar re
c) Encontrar Zi, y Zo
d) Encontrar Ay, y Aj

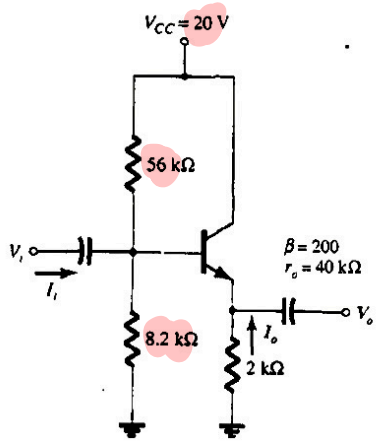


Figura 8.78

a)

$$V_B = \frac{R_2 (V_{CC})}{R_1 + R_1}$$

$$\frac{8.2\,k\Omega\,(20V)}{8.2k\Omega + 56k\Omega}$$

$$= 2.55\,V$$

UE

$$V_E = V_B - V_{BE}$$

$$2.55\,V - 0.7\,V$$

$$1.85\,V$$

IE

$$I_E = \frac{V_E}{R_E}$$

$$\frac{1.85\,V}{2k\Omega} = 0.925\,mA$$

$$I_B = \frac{I_E}{(\beta + 1)}$$

$$= \frac{0.925\ mA}{(200 + 1)}$$

$$= 4.60\ \mu A$$

$$I_C = \beta * I_B$$

$$= (200)(4.60\ \mu A)$$

$$= 0.920\ mA$$

b) r_e

$$r_c = \frac{26\ mV}{0.925\ mA}$$

$$= 28.10\ \Omega$$

c) Z_i y Z_o

(2b)

$$Z_b = \beta r_c + (\beta + 1) R_E$$

$$= (200)(28.10\ \Omega) + (200 + 1)(2K\Omega)$$

$$= 407.62K\Omega$$

$$Z_i = R_1 \parallel R_2 \parallel Z_b$$

$$= 58K\Omega \parallel 82K\Omega \parallel 407.62K$$

$$= \frac{1}{\frac{1}{58K\Omega} + \frac{1}{82K\Omega} + \frac{1}{407.62K}}$$

$$= 7.02K\Omega$$

$$Z_O = R_E \parallel R_e$$

$$= \frac{1}{\frac{1}{2K\Omega} + \frac{1}{28.10\Omega}}$$

$$= 27.71$$

d) A_V

$$A_V = \frac{R_E}{R_E + R_e} = \frac{2K\Omega}{2K\Omega + 28.10\Omega} =$$

$$= 0.986$$

9. Calcule Zi, Zo, y Ay, para la red de la figura 9.57 si IDss = 12 mA, Vp = -6 V y Yos = 40 uS.

2. $Z_0 = ?$

$A_V = ?$

$I_{DSS} = 12\,mA$

$V_P = -6\,V$

$Y_{OS} = 40\,\mu S$

$Z_i = R_G$

$Z_i = 1\,M\Omega$

$R_d = 1.8\,K\Omega$

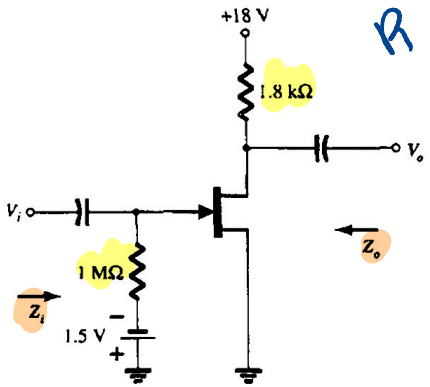


Figura 9.57 Amplificador con polarización fija para los problemas 17 y 18.

$$r_d = \frac{1}{Y_{OS}} = \frac{1}{40\,\mu S} = 0.025\,K\Omega$$

$$Z_0 = R_d \,||\, r_d$$

$$Z_0 = \frac{0.025\,K\Omega\,(1.8\,K\Omega)}{0.025\,K\Omega + 1.8\,K\Omega} = 1\,K\Omega$$

$$g_m = \frac{2\,(12\,mA)}{6\,V}\left(1 - \frac{-1.5}{-6\,V}\right) = 3\times10^{-3}\,S$$

$$A_V = -g_m Z_0 = 3\times10^{-3}\,K\Omega\,(1\,K\Omega) = 3$$