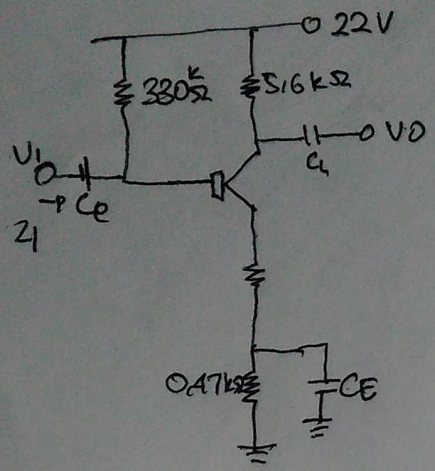
ERRI ERWANTORO
D400150083

Tugas Elektronika Analog Dasar

10.



Diketahui : $R_B = 330\,k\Omega$
$R_C = 5{,}6\,k\Omega$
$V_{CC} = 22V$
$R_E = 1{,}2 + 0{,}47$
$= 1{,}67$
$\beta = 80$
$r_o = 40k\Omega$

Ditanya : a. re
b. Z_i dan AV
c. A_i

Jawab

a. $I_B = \frac{V_{CC} - V_{be}}{Z_S}$

$= \frac{22 - 0{,}7}{330k\Omega}$

$= \frac{21{,}3}{330} = 64{,}54\,\mu A$

$I_E = \beta . I_B$

$= 80{,}64 . 54 = 5163{,}2\,kA = 5{,}16\,mA$

$r_o = \frac{20\,mV}{I_E}$

$= \frac{20\,mV}{5{,}16mA} = 3{,}87\Omega$

b. $r_o \geq 10(R_C + R_E)$

$40k\Omega \geq 10(5{,}6k\Omega + 1{,}67k\Omega)$

$40k\Omega \geq 72{,}7\,k\Omega$

$Z_i = \beta r_e$

$= 80 . 3{,}87 = 309{,}6\,\Omega$

$r_o \geq 10R_C$

$40k\Omega \geq 10, 56k\Omega$

$40k\Omega \geq 56k\Omega$

$A_V = \frac{-R_C}{R_E}$

$= \frac{-5{,}6k\Omega}{1{,}67}$

$= -3{,}3$

c. $A_i = -A_V \cdot \frac{Z_i}{R_C}$

$= 3{,}3 \cdot \frac{309{,}6}{5.6 \times 10^3}$

$= \frac{1021{,}68 \times 10^{-3}}{5{,}6}$

$= 182{,}4 \times 10^{-3}$

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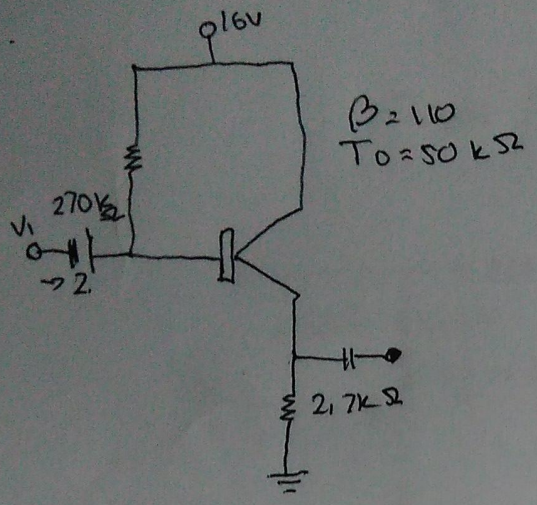
11.



Diketahui : RB = 270 kΩ
RC = 2,7 kΩ
VCC = 16V
β = 110
Ro = 50 kΩ

Ditanya : a. re, βre
b. Zo
c. AV x Ai

Jawab

a. $I_B = \frac{V_{CC} - V_{be}}{R_B + (\beta+1)R_E} = \frac{16 - 0,7}{270 + (110+1).2,7 k\Omega} = \frac{15,3}{569,7} = 26,85 \mu A$

$I_E = (\beta+1) I_B$
$= 111 . 26,85$
$= 2,980 mA$

$r_e = \frac{26 mV}{I_E} = \frac{26 mV}{2,98 mA} = 8,72 \Omega = 0,00872 k\Omega$

$\beta r_e = 110 . 8,72 = 959,2 \Omega = 0,959 k\Omega$

b. $Z_b = \beta r_e + (\beta+1) R_E$
$= 0,959 + (110+1) , 2,7 k\Omega = 300,659 k\Omega$

$Z_i = R_B \parallel Z_b$
$= 270 \parallel 300 = \frac{81000}{580} = 142 k\Omega$

$Z_o = R_E \parallel R_C$
$= 2,7 k\Omega \parallel 0,00872 = \frac{0,023544}{2,70872} = 0,0086 k\Omega$

c. $A_V = \frac{V_O}{V_I} = \frac{R_E}{R_E + r_e} = \frac{2,7 k\Omega}{2,7 k\Omega + 0,00872 k\Omega} = \frac{2,7 k\Omega}{2,70872 k\Omega} = 0,99$

$A_i = \frac{-\beta R_B}{R_b + Z_b}$

$= \frac{-110 . 270 k\Omega}{270 k\Omega + 300 k\Omega}$

$= \frac{-29700 k\Omega}{570}$

$= -52,10$

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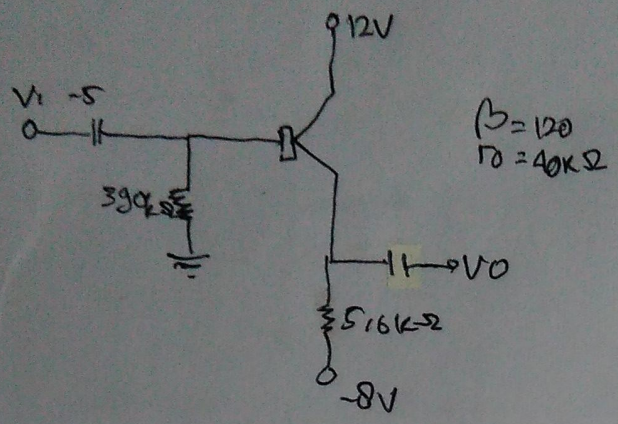
12.



$\beta = 120$
$r_o = 40k\Omega$

Diketahui : R_C 390
$R_E = 5,6\,k\Omega$
$V = 12V$
$\beta = 120$
$R_o = 40k\,\Omega$

Ditanya : a. Z_i, R_{20}
b. AV
c No jika $V_i = 1mV$

Jawab

a $Z_i = R_6 \,||\, r_e$
$= 5,6 \,||\, 167$
$= \frac{0,09352}{5,6167}$
$= 0,0616k\Omega$
$20 = R_L = 390k\Omega$

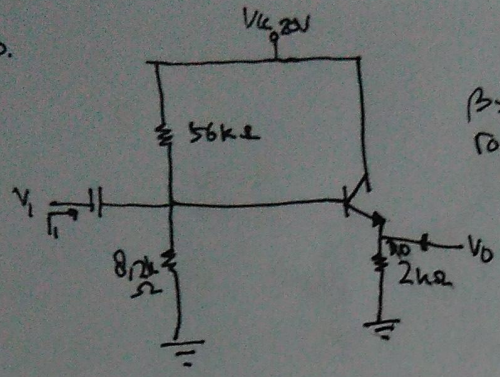
$I_E = \frac{V_{EE} - V_{BE}}{R_E}$
$= \frac{0 - 0,7}{5,6k\Omega}$
$= 1,55mA$

b. $A_V = \frac{-(R_C \,||\, r_o)}{r_e}$
$= -\left(\frac{390 \,||\, 40}{0,0167}\right)$
$= -\frac{36,27}{0,0167}$
$= -2172,3$

$r_e = \frac{26mV}{I_E}$
$= \frac{26}{1,55}$
$= 16,7\,\Omega$

c. $A_V = \frac{V_O}{V_i}$
$-2172,3 = \frac{V_O}{1mV}$
$V_O = -2172.3mV$

13.



$\beta = 200$
$r_o = 40\,k\Omega$

Diket : $R_B = 8,2k\Omega + 56\,k\Omega$
$= 64,2k\Omega$
$R_C = 2k\Omega$
$\beta = 200$
$r_o = 40\,k\Omega$
$V_{CC} = 20V$

Ditanya a. I_B dan I_C
b. r_e
c Z_i dan Z_o
d A_V dan A_I

Jawab:

a. $I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{20 - 0,7}{64,2k\Omega} = 300,6\,\mu A$

b. $r_e = \frac{26\,mV}{I_E}$

$= \frac{26\,mV}{60,42\,mA}$

$= 0,43\Omega$

$I_E = (\beta + 1)\, I_B$
$= (200+1)\, 300,6\,\mu A$
$= 201 \cdot 300,6$
$= 60420,6\,\mu A = 60,42\,mA$

c. $\beta r_e = 200 \cdot 0,43 = 88\Omega = 0,086\,k\Omega$

$Z_i = R_B \,||\, \beta r_e$
$= 64,2 \,||\, 0,086$
$= \frac{5,5212}{64,286} = 0,085\,k\Omega$

$Z_o = R_e \,||\, r_e = 2 \,||\, 0,43 = 353,90\Omega$

d. $A_V = -\frac{R_C}{R_e}$

$= \frac{-2k\Omega}{0,43\Omega} = 4651$

$A_I = -A_V \frac{Z_i}{R_C}$

$= +4651 \cdot \frac{0,085\,k\Omega}{2\,k\Omega}$

$= 197,66$

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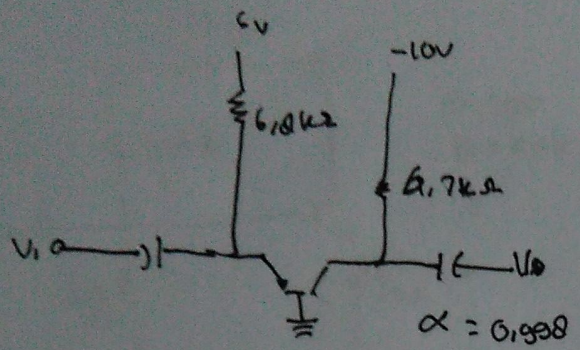
14.



$\alpha = 0{,}998$

$ro = 100\Omega$

Diket : $RE = 6{,}8\ k\Omega$

$Rc = 4{,}7\ k\Omega$

$VEE = 6V$

$VC = -10V$

Ditanya : a. Re

b. Z_i dan Z_o

c. A_V dan A_I

a. $IE = \frac{VEE - VBE}{RE} = \frac{6V - 0{,}7V}{6{,}8\ k\Omega} = \frac{5{,}3}{6{,}8} = 779{,}41\ mA$

$re = \frac{26\ mV}{Ie} = \frac{26}{779{,}41} = 0{,}0333\ \Omega$

b. $Z_i = RE \parallel re$

$= 6{,}8 \parallel 0{,}0333$

$= \frac{224{,}4}{6800{,}03}$

$= 0{,}033\ \Omega$

$Zo = Rc = 4{,}7\ k\Omega$

c. $AV \cong \frac{Rc}{Re} = \frac{4{,}7}{0{,}033} = 142424$

$A_I = -0{,}998$

$= 1$

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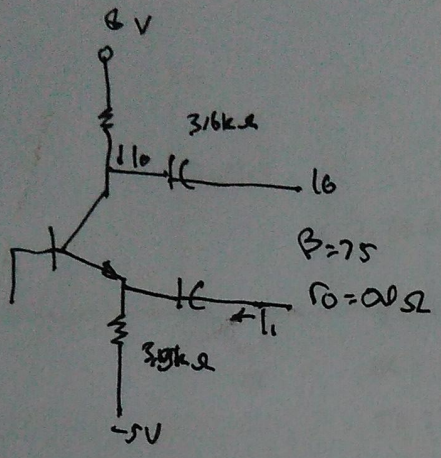
15.



Diket : $R_C = 3,6\ k\Omega$
$R_E = 3,9\ k\Omega$
$V_{CC} = 8V$
$V_{EE} = -5V$

Ditanya a. A_V
b A_i

Jawab

a. $A_V = \frac{R_C}{r_e}$

$= \frac{3,6\ k\Omega}{-17,80\ \Omega}$

$= -202\Omega$

$I_E = \frac{V_{EE} - V_{BE}}{R_E}$

$= \frac{-5 - 0,7}{3,9\ k\Omega}$

$= \frac{-5,7}{3,9} = 1,46\ mA$

$r_e = \frac{26\ mV}{1,5}$

$= \frac{26mV}{-1,46}$

$= -17,80\ \Omega$

b. $A_i = -1$