

diketahui : $R_B = 270 \text{ k}\Omega$
 $R_E = 2.7 \text{ k}\Omega$
 $V_{CC} = 16 \text{ V}$
 $\beta = 110$

$r_e = 50 \text{ k}\Omega$

ditanya : a. r_e , βr_e
 b. Z_i dan Z_o
 c. A_v dan A_i

Jawab :

$$a. I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta + 1) R_E} = \frac{16 - 0.7}{270 + (110 + 1) \cdot 2.7 \text{ k}\Omega} = \frac{15.3}{569.7} = 26.85 \text{ }\mu\text{A}$$

$$I_E = (\beta + 1) \cdot I_B$$

$$= 111 \cdot 26.85 = 2.980 \text{ mA}$$

$$r_e = \frac{26 \text{ mV}}{I_E} = \frac{26 \text{ mV}}{2.98 \text{ mA}} = 8.72 \text{ }\Omega = 0.00872 \text{ k}\Omega$$

$$\beta r_e = 110 \cdot 8.72 = 959.2 \text{ }\Omega = 0.959 \text{ k}\Omega$$

$$b. Z_b = \beta r_e + (\beta + 1) R_E$$

$$= 0.959 + (110 + 1) \cdot 2.7 \text{ k}\Omega = 300.659 \text{ k}\Omega$$

$$Z_i = R_B \parallel Z_b$$

$$= 270 \parallel 300 = \frac{81000}{570} = 142 \text{ k}\Omega$$

$$Z_o = R_E \parallel r_e$$

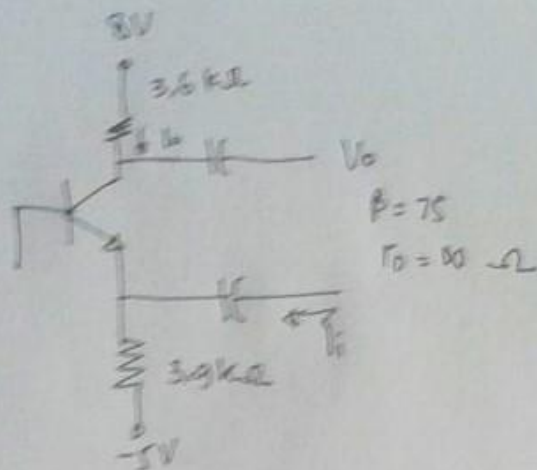
$$= 2.7 \text{ k}\Omega \parallel 0.00872 = \frac{0.023544}{2.70872} = 0.0086 \text{ k}\Omega$$

$$c. A_v = \frac{V_o}{V_i} = \frac{R_E}{R_E + r_e} = \frac{2.7 \text{ k}\Omega}{2.7 \text{ k}\Omega + 0.00872 \text{ k}\Omega} = \frac{2.7 \text{ k}\Omega}{2.70872 \text{ k}\Omega} = 0.99$$

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

$$= - \frac{110 \cdot 270 \text{ k}\Omega}{270 \text{ k}\Omega + 300 \text{ k}\Omega} = - \frac{29700 \text{ k}\Omega}{570 \text{ k}\Omega} = 52.10$$

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diketahui = $R_c = 3.6k\Omega$
 $R_E = 3.9k\Omega$
 $V_{CC} = 8V$
 $V_{EE} = -5V$

ditanya = a. A_v
 b. A_i

jawab =

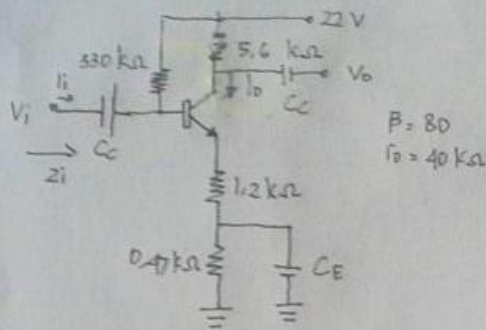
$$\begin{aligned} \text{a. } A_v &= \frac{R_c}{r_e} \\ &= \frac{3.6k\Omega}{-17.80\Omega} \\ &= -202.2 \end{aligned}$$

$$\begin{aligned} I_E &= \frac{V_{EE} - V_{BE}}{R_E} \\ &= \frac{-5 - 0.7}{3.9k\Omega} \\ &= \frac{-5.7}{3.9} = -1.46 \text{ mA} \end{aligned}$$

$$\begin{aligned} r_e &= \frac{26 \text{ mV}}{I_E} \\ &= \frac{26 \text{ mV}}{-1.46} \\ &= -17.80\Omega \end{aligned}$$

$$\text{b. } A_i = -1$$

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

ditanya = a. r_e
 b. Z_i dan A_v
 c. A_i

Jawab =

a. $I_B = \frac{V_{CC} - V_{be}}{R_B}$
 $= \frac{22 - 0,7}{330 \text{ k}\Omega}$
 $= \frac{21,3}{330} = 64,54 \text{ }\mu\text{A}$

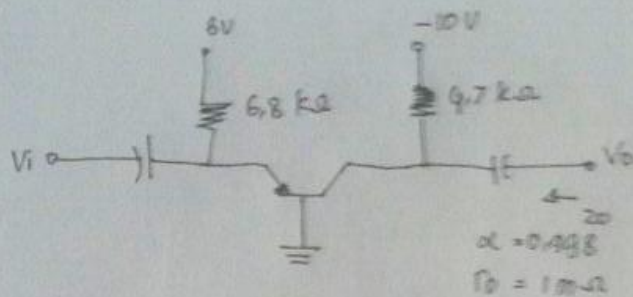
$I_E = \beta \cdot I_B$
 $= 80 \cdot 64,54 = 5163,2 \text{ }\mu\text{A} = 5,16 \text{ mA}$
 $r_e = \frac{20 \text{ mV}}{I_E}$
 $= \frac{20 \text{ mV}}{5,16 \text{ mA}} = 3,87 \Omega$

b. $r_o \gg 10 (R_C + R_E)$
 $40 \text{ k}\Omega \gg 10 (5,6 \text{ k}\Omega + 1,67 \text{ k}\Omega)$
 $40 \text{ k}\Omega \gg 72,7 \text{ k}\Omega$
 $Z_i = \beta r_e$
 $= 80 \cdot 3,87 = 309,6 \Omega$

$r_o \gg 10 R_C$
 $40 \text{ k}\Omega \gg 10 \cdot 5,6 \text{ k}\Omega$
 $40 \text{ k}\Omega \gg 56 \text{ k}\Omega$
 $A_v = -\frac{R_C}{R_E}$
 $= -\frac{5,6 \text{ k}\Omega}{1,67 \text{ k}\Omega} = -3,3$

c. $A_i = -A_v \frac{Z_i}{R_C}$
 $= 3,3 \cdot \frac{309,6}{5,6 \times 10^3}$
 $= \frac{1021,68 \times 10^{-3}}{5,6}$
 $= 182,4 \times 10^{-3}$

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diketahui =

$$R_E = 6,8 \text{ k}\Omega$$

$$R_C = 4,7 \text{ k}\Omega$$

$$V_{EE} = 6 \text{ V}$$

$$V_C = -10 \text{ V}$$

ditanya = a. r_e
 b. Z_i dan Z_o
 c. A_v dan A_i

jawab =

$$a. I_E = \frac{V_{EE} - V_{BE}}{R_E} = \frac{6 \text{ V} - 0,7 \text{ V}}{6,8 \text{ k}\Omega} = \frac{5,3}{6,8} = 779,41 \text{ } \mu\text{A}$$

$$r_e = \frac{26 \text{ mV}}{I_E} = \frac{26}{779,41} = 0,0333 \text{ } \Omega$$

$$b. Z_i = R_E \parallel r_e$$

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

$$= \frac{224,4}{6800,03} = 0,033 \text{ } \Omega$$

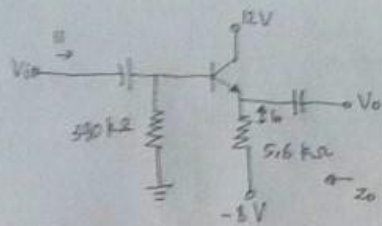
$$Z_o = R_C = 4,7 \text{ k}\Omega$$

$$c. A_v \cong \frac{R_C}{r_e} = \frac{4,7}{0,033} = 142424$$

$$A_i = -0,998$$

$$= 1$$

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$\beta = 120$
 $r_o = 40 \text{ k}\Omega$

diketahui = $R_C = 390 \text{ k}\Omega$
 $R_E = 5.6 \text{ k}\Omega$
 $V_i = 12 \text{ V}$
 $\beta = 120$
 $r_o = 40 \text{ k}\Omega$

ditanya = a. Z_i dan Z_o
b. A_v

c. V_o jika $V_i = 1 \text{ mV}$

Jawab =

a. $Z_i = R_E \parallel r_e$
 $= 5.6 \parallel 16.7$
 $= \frac{0.09352}{5.6167}$
 $= 0.0166 \text{ k}\Omega$

$Z_o = R_C = 390 \text{ k}\Omega$

$Z_o = 390 \text{ k}\Omega$

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

$$= \frac{-8 - 0.7}{5.6 \text{ k}\Omega}$$

$$= 1.55 \text{ mA}$$

$$r_e = \frac{26 \text{ mV}}{I_E}$$

$$= \frac{26}{1.55}$$

$$= 16.7 \text{ }\Omega$$

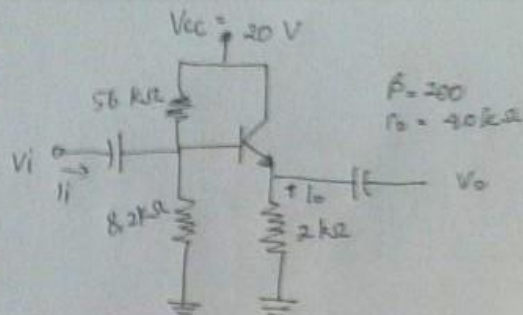
b. $A_v = - \left(\frac{R_C \parallel r_o}{r_e} \right)$
 $= - \left(\frac{390 \parallel 40}{0.0167} \right)$
 $= - \frac{36.27}{0.0167}$
 $= -2172.3$

c. $A_v = \frac{V_o}{V_i}$

$-2172.3 = \frac{V_o}{1 \text{ mV}}$

$V_o = -2172.3 \text{ mV}$

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diketahui : $R_B = 8,2 \text{ k}\Omega + 56 \text{ k}\Omega = 64,2 \text{ k}\Omega$

$R_C = 2 \text{ k}\Omega$

$\beta = 200$

$r_o = 40 \text{ k}\Omega$

$V_{CC} = 20 \text{ V}$

ditanya = a. I_B dan I_C

b. r_e

c. Z_i dan Z_o

d. A_v dan A_i

jawab =

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

$$I_C = \frac{V_{CC} - V_{BE}}{R_C} = 9,65 = 9650 \text{ }\mu\text{A}$$

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

$$I_E = \frac{26 \text{ mV}}{60,42 \text{ mA}} = 0,43 \text{ }\Omega$$

$$I_E = \frac{(\beta + 1) I_B}{(200 + 1)} = 300,6 \text{ }\mu\text{A}$$

$$= 201 \cdot 300,6 \text{ }\mu\text{A}$$

$$= 60420,6 \text{ }\mu\text{A} = 60,42 \text{ mA}$$

$$c. \beta_{re} = 200 \cdot 0,43 = 86 \text{ }\Omega = 0,086 \text{ k}\Omega$$

$$Z_i = R_B \parallel \beta_{re}$$

$$= 64,2 \parallel 0,086$$

$$= \frac{5,5212}{64,286} = 0,085 \text{ k}\Omega$$

$$Z_o = R_E \parallel r_{e2} = 2 \parallel 0,43 = 353,90 \text{ }\Omega$$

$$d. A_v = - \frac{R_C}{r_e}$$

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

$$A_i = -A_v \frac{Z_i}{R_C}$$

$$= +4651 \cdot \frac{0,085 \text{ k}\Omega}{2 \text{ k}\Omega} = 197,66$$