

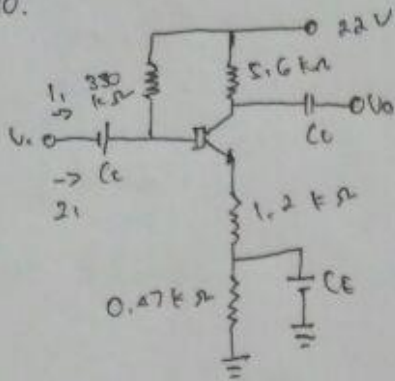
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### TUGAS ELEKTRONIKA ANALOG DASAR

10.



Diketahui :  $R_B = 330 \text{ k}\Omega$

$R_C = 5.6 \text{ k}\Omega$

$V_{CC} = 22 \text{ V}$

$R_E = 1.2 + 0.47$

$= 1.67$

$\beta = 80$

$r_o = 10 \text{ k}\Omega$

Ditanya: a.  $r_e$   
b.  $r_i$  dan  $A_v$   
c.  $A_i$

Jawab

$$a. I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$= \frac{22 - 0.7}{330 \text{ k}\Omega}$$

$$= \frac{21.3}{330} = 64.54 \text{ }\mu\text{A}$$

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

$$10 \text{ k}\Omega \geq 10(5.6 \text{ k}\Omega + 1.67 \text{ k}\Omega)$$

$$10 \text{ k}\Omega \geq 72.7 \text{ k}\Omega$$

$$r_i = \beta r_e$$

$$= 80 \cdot 3.87 = 309.6 \Omega$$

$$I_E = \beta \cdot I_B$$

$$= 80 \cdot 64.54 \text{ }\mu\text{A} = 5163.2 \text{ }\mu\text{A} = 5.16 \text{ mA}$$

$$r_e = \frac{20 \text{ mV}}{I_E}$$

$$= \frac{20 \text{ mV}}{5.16 \text{ mA}} = 3.87 \Omega$$

$$r_o \geq 10 R_C$$

$$10 \text{ k}\Omega \geq 10 \cdot 5.6 \text{ k}\Omega$$

$$10 \text{ k}\Omega \geq 56 \text{ k}\Omega$$

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

$$= -\frac{5.6 \text{ k}\Omega}{1.67} = -3.3$$

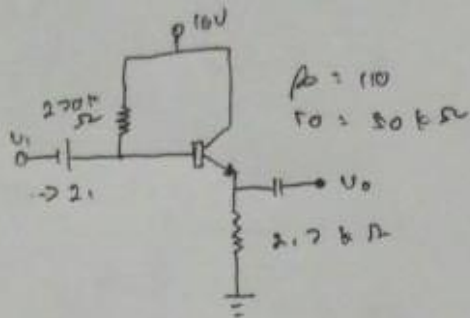
$$c. A_i = -A_v \frac{r_i}{r_o}$$

$$= 3.3 \cdot \frac{309.6}{5.6 \times 10^3}$$

$$= \frac{1021.68 \times 10^{-3}}{5.6}$$

$$= 182.4 \times 10^{-3}$$

11.



Diketahui :  $R_B = 270 \text{ k}\Omega$   
 $R_E = 2.7 \text{ k}\Omega$   
 $V_{CC} = 16 \text{ V}$   
 $\beta = 110$   
 $r_D = 50 \text{ k}\Omega$

Ditanya : a.  $r_e$  ,  $\beta r_e$   
 b.  $Z_i$  &  $Z_o$   
 c.  $A_v$  &  $A_i$

Jawab :

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

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

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

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

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

$$Z_i = \beta r_e + (\beta + 1) R_E$$

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

$$Z_i = R_B \parallel Z_i$$

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

$$Z_o = R_E \parallel R_C$$

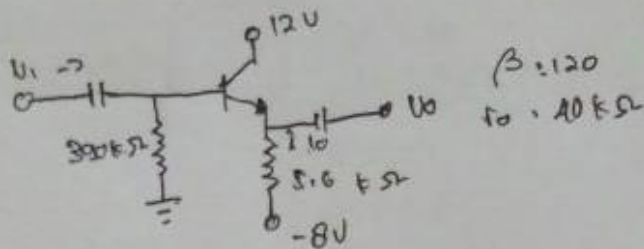
$$= 2.7 \text{ k}\Omega \parallel 0.00872 = \frac{0.023544}{2.70872} = 0.0086 \text{ k}\Omega$$

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

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

$$= \frac{-110 \cdot 270 \text{ k}\Omega}{270 \text{ k}\Omega + 300 \text{ k}\Omega} = \frac{-2970 \text{ k}\Omega}{570} = -52.10$$

12.



$$D_{ref} : R_C : 390 \text{ k}\Omega$$

$$R_E : 5.6 \text{ k}\Omega$$

$$V_i : 12 \text{ V}$$

$$\beta : 120$$

$$R_o : 40 \text{ k}\Omega$$

$$\text{Ditanya: a } 2. \text{ \& } 20$$

$$b \text{ } A_v$$

$$c \text{ No jika } V_i = 1 \text{ mV}$$

Jawab

$$a. 2. : R_E \parallel R_L$$

$$= 5.6 \parallel 40$$

$$= \frac{0.09352}{5.6167}$$

$$= 0.0167$$

$$= 0.0167 \text{ k}\Omega$$

$$20 : R_C = 390 \text{ k}\Omega$$

$$b. A_v = - \left( \frac{R_C \parallel R_L}{r_e} \right)$$

$$= - \left( \frac{390 \parallel 40}{0.0167} \right)$$

$$= - \frac{36.127}{0.0167}$$

$$= - 2172.3$$

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

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

$$= 1.55 \text{ mA}$$

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

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

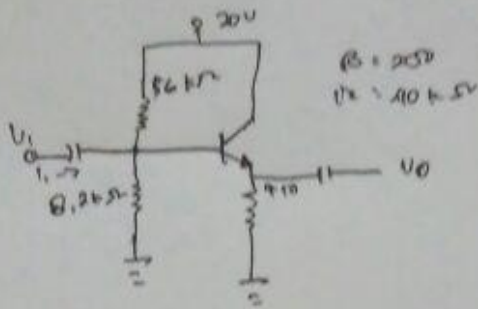
$$= 16.7 \text{ }\Omega$$

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

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

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

13.



$$R_{th} = R_B = 8.2 \text{ k}\Omega + 56 \text{ k}\Omega = 64.2 \text{ k}\Omega$$

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

$$R_B = 200$$

$$R_E = 10 \text{ k}\Omega$$

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

Ditanya: a.  $I_B$  dan  $I_C$

b.  $r_e$

c.  $Z_i$  dan  $Z_o$

d.  $A_V$  dan  $A_i$

Jawab

$$a. I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{20 - 0.7}{64.2 \text{ k}\Omega} = 300.6 \text{ nA}$$

$$I_C = \frac{V_{CC} - V_{BE}}{R_C} = 9.65 = 9650 \text{ nA}$$

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

$$= \frac{26 \text{ mV}}{60.12 \text{ mA}}$$

$$= 0.43 \Omega$$

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

$$= (200 + 1) \cdot 300.6 \text{ nA}$$

$$= 201 \cdot 300.6 \text{ nA}$$

$$= 60420.6 \text{ nA} = 60.42 \text{ mA}$$

$$c. \beta r_e = 200 \cdot 0.43 = 86 \Omega \approx 0.086 \text{ k}\Omega$$

$$Z_i = R_B \parallel \beta r_e$$

$$= 64.2 \text{ k}\Omega \parallel 0.086$$

$$= \frac{5.5212}{64.286}$$

$$= 0.085 \text{ k}\Omega$$

$$Z_o = R_E \parallel r_e = 2 \parallel 0.43 = 353.30 \Omega$$

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

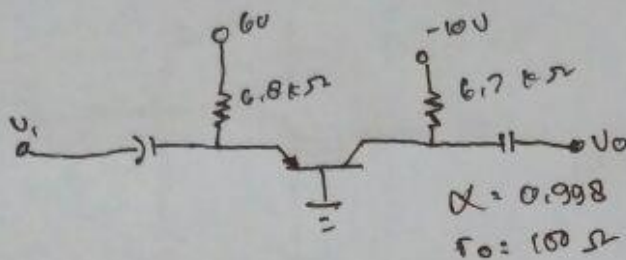
$$= - \frac{2 \text{ k}\Omega}{0.43 \Omega} = -4651$$

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

$$= +4651 \cdot \frac{0.085 \text{ k}\Omega}{2 \text{ k}\Omega} = 197.66$$



14.



diketahui :

$$R_E = 6.8 \text{ k}\Omega$$

$$R_C = 4.7 \text{ k}\Omega$$

$$V_{BE} = 60$$

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

Ditanya :

- a.  $r_e$
- b.  $z_i$  dan  $z_o$
- c.  $A_v$  dan  $A_i$

Jawab

$$a. I_E = \frac{V_{EE} - V_{BE}}{R_E} = \frac{60 - 0.7 \text{ V}}{6.8 \text{ k}\Omega} = \frac{5.3}{6.8} = 779.41 \text{ mA}$$

$$r_e = \frac{26 \text{ mV}}{I_E} = \frac{26}{779.41} = 0.0333 \text{ }\Omega$$

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

$$= 6.8 \parallel 0.0333$$

$$= \frac{224.1}{6800.03} = 0.033 \text{ }\Omega$$

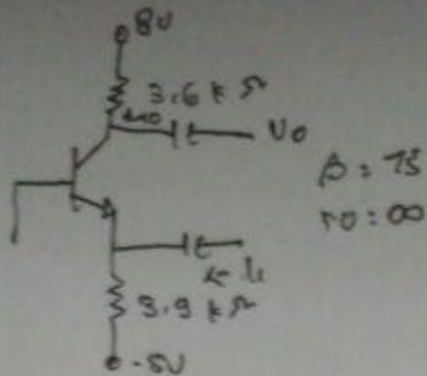
$$z_o = R_C = 4.7 \text{ k}\Omega$$

$$c. A_v = \frac{R_C}{r_e} = \frac{4.7}{0.033} = 142.424$$

$$A_i = -0.998$$

$$\approx 1$$

12.



Diketahui :  $R_C = 3.6 \text{ k}\Omega$   
 $R_E = 3.9 \text{ k}\Omega$   
 $V_{CC} = 8V$   
 $V_{EE} = -5V$

Ditanya :  $A_V$  ?  
 $A_i$  =

Jawab

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

$$= \frac{3.6 \text{ k}\Omega}{17.80 \Omega}$$

$$= -202.2$$

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

$$= \frac{-5 - 0.7}{3.9 \text{ k}\Omega}$$

$$= \frac{-5.7}{3.9} = 1.46 \text{ mA}$$

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

$$= \frac{26 \text{ mV}}{1.46}$$

$$= 17.80 \Omega$$