1. $\beta_{dc} = 200$
$RC = 2k\Omega$
$V_{CC} = 10V$
$R_B = 220k\Omega$
$V_{BB} = 4V$

~~I_C~~ $V_{CE} = V_{CC} - I_C R_C$, $V_{CE} = 10 - I_C R_C$

$$I_C = \frac{V_{CC} - V_{CE}}{R_C}$$

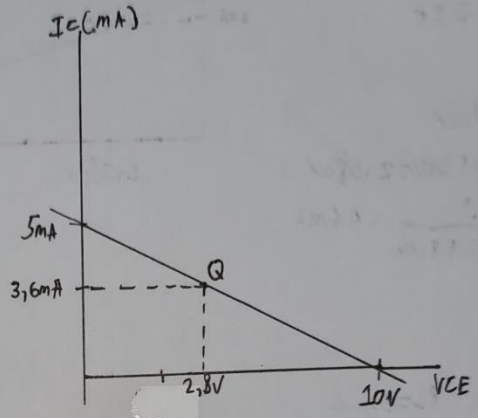
$$I_C = \frac{10 - V_{CE}}{2k}$$

$V_{CE} = 0$, $I_C = 5mA$

$I_C = 0$, $V_{EE} = 10V$

$$I_B = \frac{V_{BB} - V_{EE}}{R_B}$$

$$= \frac{9}{220k} = 1,8 \times 10^{-5} A$$



$I_C = 200 \times (1,8 \times 10^{-5})$
$= 0,0036 A$

$V_{CE} = V_{CC} - I_C R_C$
$= 10V - (0,0036)(2k)$
$= 2,8V$

2. $\beta_{dc} = 200$
$R_C = 470\Omega$
$V_{CC} = 5V$
$R_B = 51k\Omega$
$V_{BB} = 5V$

$$I_B = \frac{V_{BB} + V_{EE}}{R_B}$$

$$= \frac{5 + 0,7}{51k} = 8,93 \times 10^{-5} A$$

$I_C = \beta_{dc} \cdot I_B$
$= 200 \cdot 8,93 \times 10^{-5} A$
$= 1,68 \times 10^{-2} A$

$V_B = I_B \cdot R_B$
$= 8,93 \times 10^{-5} \cdot 51k$
$= 4,29V$

$V_C = I_C \cdot R_C$
$= 1,68 \times 10^{-2} \cdot 470$
$= 7,896V$

$V_E = 0,7V$

$V_C > V_B > V_E$
$7,896 > 4,29 > 0,7$
∴ Transistor dalam kondisi aktif

3. $\beta dc = 100$ $\quad Rc = 2{,}2k\Omega$

$R1 = 27k\Omega$ $\quad RE = 1{,}2k\Omega$

$R2 = 15k\Omega$ $\quad Vcc = 9V$

$$VBB = \frac{R2}{R2+R1} \cdot Vcc = \frac{15k}{27k+15k} \cdot 9 = 3{,}214V$$

$$VE = VBB - VBE = 3{,}214 - 0{,}7 = 2{,}514V$$

$$IE = \frac{2{,}514}{1{,}2k} = 0{,}002095 \approx Ic$$

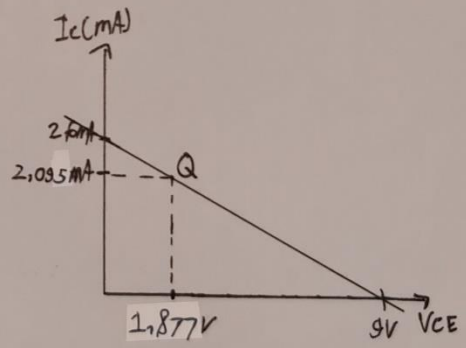
$$Vc = Vcc - IcRc$$

$$= 9 - (0{,}002095)(2{,}2k) = 4{,}391V$$

$$VCE = Vc - VE = 4{,}391 - 2{,}514 = 1{,}877V$$

$$VCE = 0 \rightarrow Ic = \frac{Vcc}{Rc+RE} = \frac{9}{2{,}2k+1{,}2k} = 2{,}6mA$$

$Ic = 0 \rightarrow VCE = 9V$



4. $$VBB = \frac{50k}{50k+100k} \cdot 15 = 5V$$

$$VE = VBB - VBE = 5 - 0{,}7 = 4{,}3V$$

$$IE = \frac{VE}{RE} = \frac{4{,}3}{3k} = 1{,}43mA \approx Ic$$

$$re' = \frac{25m}{1{,}43m} = 17{,}482\Omega$$

$$rc = \frac{Rc \cdot RL}{Rc+RL} = \frac{5k \cdot 10k}{5k+10k} = \frac{50M}{15k} = 3{,}33k\Omega$$

$$Av = \frac{rc}{re'} = \frac{3{,}33k}{17{,}482} = 190{,}481$$

$$Vout = Av \cdot Vin = 190{,}481 \cdot 2M = 380{,}962MV$$