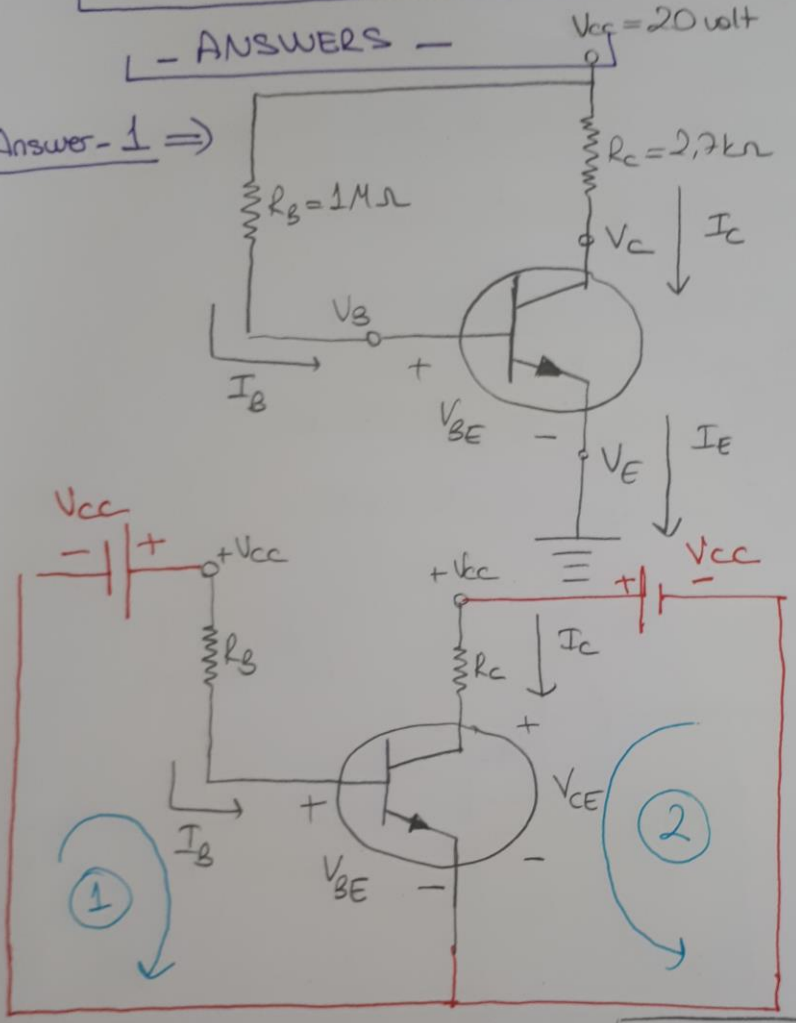
ECE 246 HOMEWORK

ANSWERS

Answer-1 ⇒



1.loop ⇒ $V_{cc} - I_B R_B - V_{BE} = 0$

$V_{BE} \cong 0,7$ volt

$(20\text{ volt}) - I_B(1M\Omega) - (0,7V) = 0$

$1M\Omega = 1.000k\Omega$

$(20\text{ volt}) - I_B(1000k\Omega) - (0,7V) = 0$

$19,3\text{ volt} = 1000\, I_B$

$I_B = 193 \times 10^{-4}\,\mu A$

$1\,\mu A = 10^{-6} A = 10^{-3}\,mA$

2.loop $V_{cc} - I_c R_c - V_{CE} = 0$

$I_E = 0\,mA$

$V_E = 0\,volt$

$V_{CE} = (20\,volt) - I_c (2{,}7\,k\Omega)$

$I_c = \beta I_B$ Assume $\beta = 500$

($\beta \rightarrow$ You can give the value of Beta that you want)

$I_c = 500\,(193 \times 10^{-4}) = 865 \times 10^{-2} = 9{,}65\,mA$

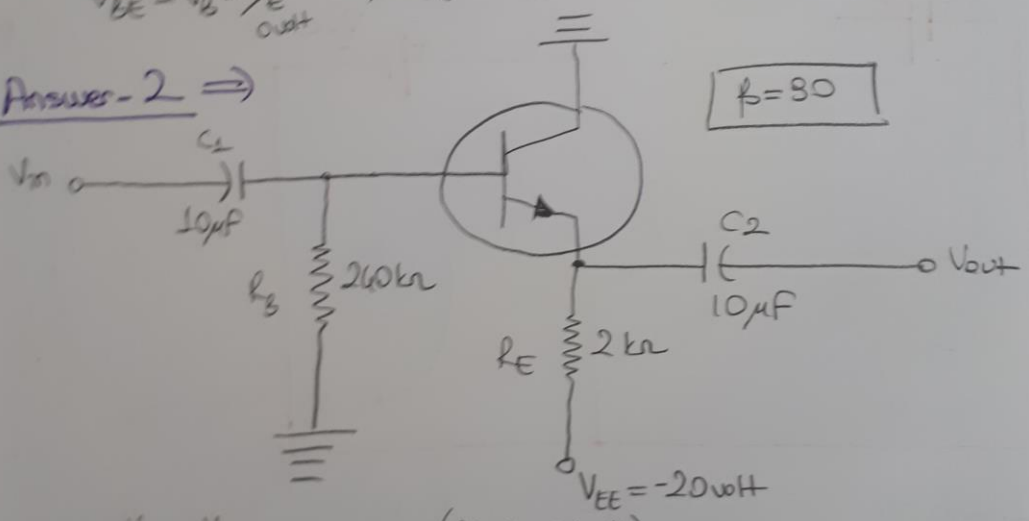
$V_{CE} = (20\,volt) - (9{,}65\,mA)\,(2{,}7\,k\Omega)$

$V_{CE} \cong 26{,}055\,volt$

$V_{CE} = V_C - \cancel{V_E}^{0\,volt} \Rightarrow V_{CE} = V_C = 26{,}055\,volt$

$V_{BE} = V_B - \cancel{V_E}^{0\,volt} \Rightarrow V_{BE} = V_B = 0{,}7\,volt$

Answer-2 $\Rightarrow$



$I_B = \dfrac{V_{EE} - V_{BE}}{R_B + (\beta+1) R_E} = \dfrac{(20\,volt - 0{,}7\,volt)}{(260k\Omega) + (80+1)\,(2k\Omega)} = 45{,}73\,\mu A$

$V_{CE_Q} = 0 - I_{E_Q} R_E - V_{EE} = 20 - (4{,}16\,mA)\,(2k\Omega) = 11{,}68\,volt$

$I_{E_Q} = \dfrac{0 - V_{BE} - V_{EE}}{\frac{R_B}{(\beta+1)} + R_E} = \dfrac{20 - 0{,}7}{\frac{240}{(80+1)} + 2} = 4{,}16\,mA$

As $V_{CEQ} > V_{CE(sat)} = 0$ volt, Transistor is in the active state