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Answer to the question no. 1

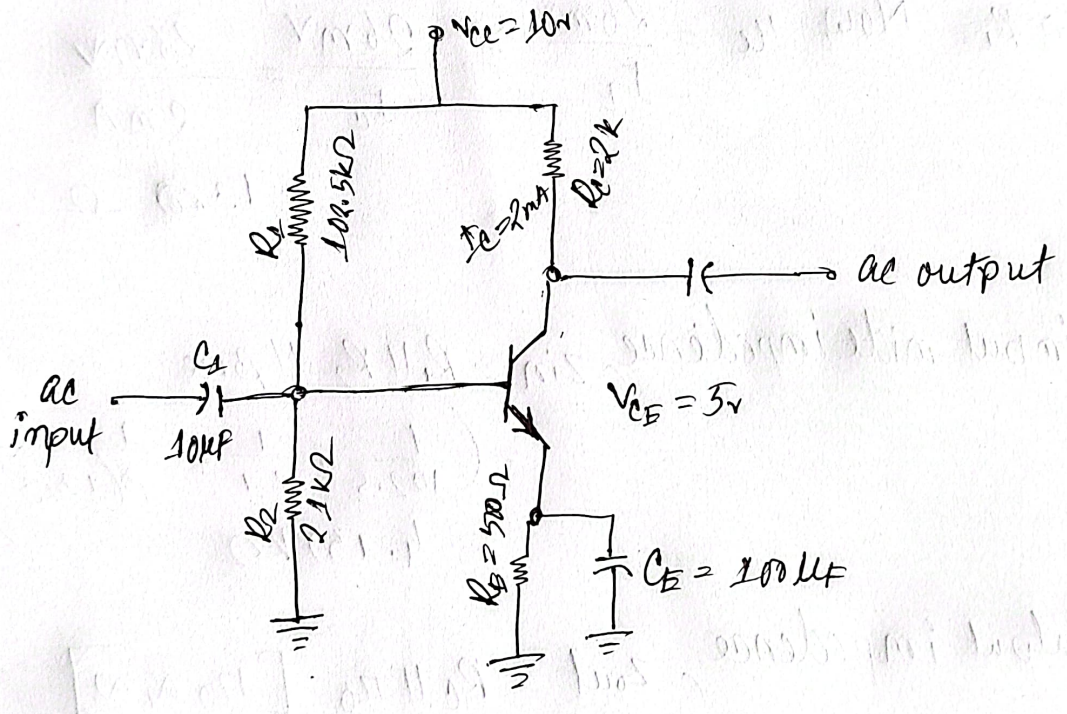
The last three digit of my id: 1+2+9 = 12 (even)

So, my bjt model is BC547C

$V_{CC} = 10V$

$I_C = 2mA$, $V_{CE} = 5V$ $\beta(min) = 420$

$$I_B = \frac{I_C}{\beta} = \frac{2mA}{420} = 4.76 \times 10^{-3} mA$$



$$V_E = \frac{1}{10} V_{CC} = \frac{1}{10} \times 10 = 1V$$

$$R_E = \frac{V_E}{I_E} \approx \frac{V_E}{I_C} = \frac{1}{2 \times 10^{-3}} = 500\Omega$$

$$V_{RC} = V_{CC} - V_{CE} - V_E = 10 - 5 - 1 = 4V$$

$$\therefore R_C = \frac{V_{RC}}{I_C} = \frac{4}{2 \times 10^{-3}} = 2000 = 2k\Omega$$

$V_B = V_{BE} + V_E = 0.7 + 1V$

$= 1.7V$

Now,

$V_B = \frac{R_2}{R_1+R_2} V_{cc}$

$\Rightarrow 1.7 = \frac{21}{R_1+21} \times 10$

$\Rightarrow R_1 = 102.5K\Omega$

$R_2 \leq \frac{1}{10} \beta R_E$

$\Rightarrow R_2 \leq \frac{1}{10} \times 420 \times 500.$

$\therefore R_2 \leq 21K\Omega.$

Now $r_e = \frac{26mV}{I_E} \cong \frac{26mV}{I_C} = \frac{26mV}{2mA}$

$= 13\Omega.$

input impedence, $Z_{in} = R_1 \| R_2 \| \beta r_e$

$= \left(\frac{1}{102.5} + \frac{1}{21} + \frac{1}{\beta(13\times 3^{-10})}\right)^{-1}$

$= 4.137K\Omega$

Output impedence, $Z_{out} = R_c \| r_o \quad [r_o \propto \infty]$

$= \left(\frac{1}{R_c} + \frac{1}{r_o}\right)^{-1}$

$= R_c = 2K\Omega$

Input ac $= (1+2+9) \div 3 = \frac{12}{3} = 4mV.$

Answer to the question no. 2

My aid is 129;

So, (1+2+9) = 12;

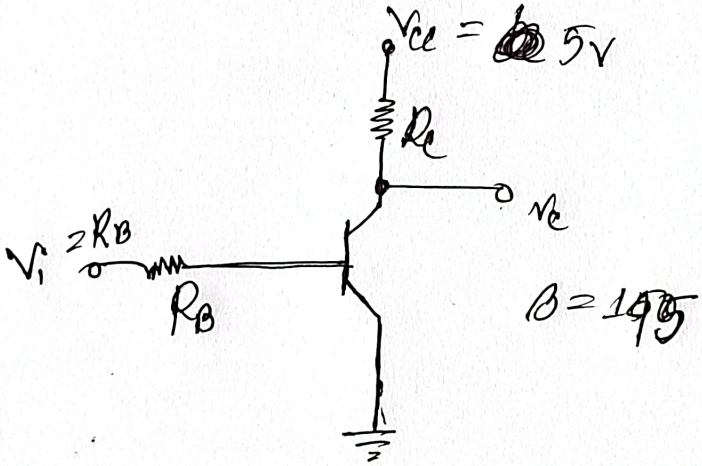
model no. 5RD-09VDC-5L-C

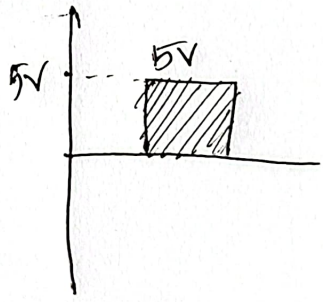
9V

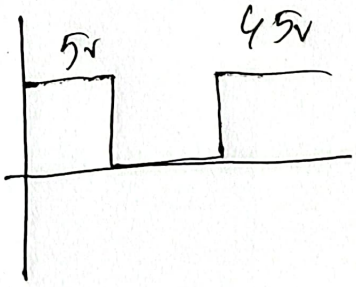
here, $I_{Csat} = 50mA$

Using BC637 BJT

for 50 mA, $\beta = 145$ (120 to 165)





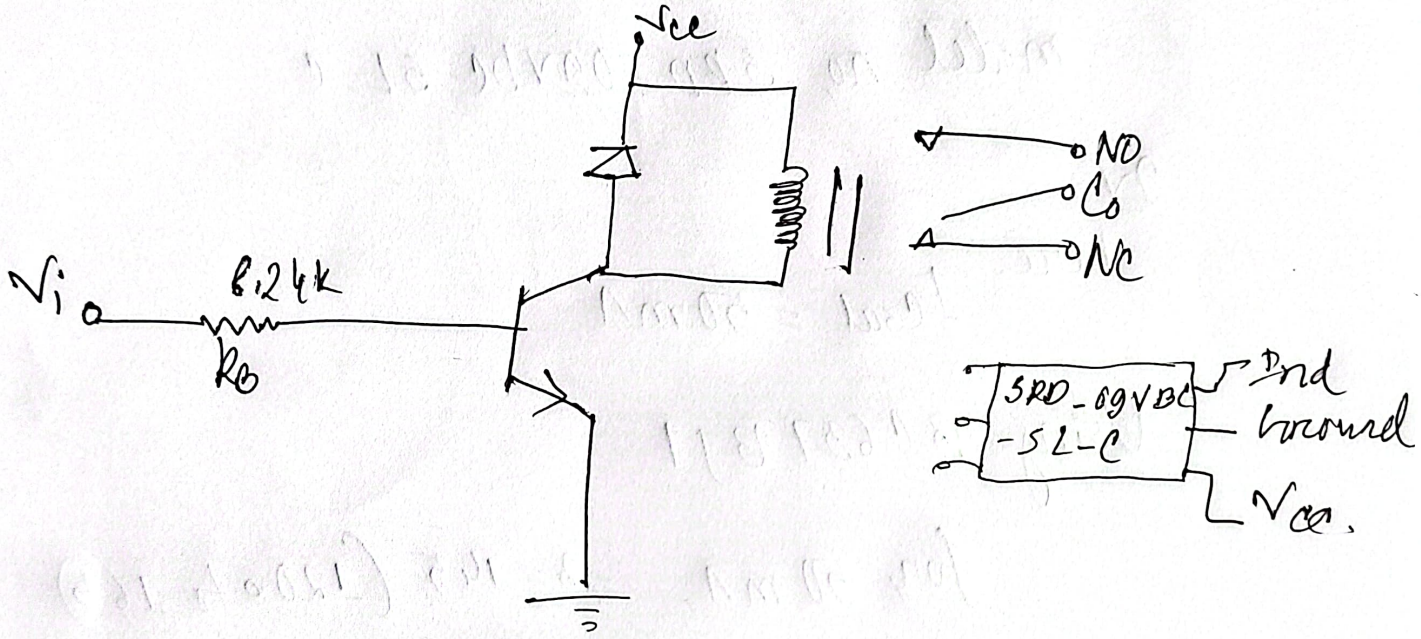


$I_B > \frac{I_{Csat}}{\beta}$

$\therefore I_B > 0.34mA$

Let, $I_B = 0.689\,mA$

$$\therefore R_B = \frac{V_i - 0.7}{I_B} = \frac{5 - 0.7}{0.689} = 6.24\,k\Omega$$



$V_i = 6.24k\Omega$