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Problem - 1:

My student ID's last 3 digits are 036.

So, $x = 0+3+6 = 9 = \text{odd}$

So, the BJT model is BC548.

From Datasheet,

$$I_c = 2\,mA$$

$$V_{CE} = 5\,V$$

$$V_{CC} = 10\,V$$

$$\beta = 110\ (\text{min})$$

Now,

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

$$R_E = \frac{V_E}{I_E} \approx \frac{V_E}{I_c} = \frac{1V}{2\,mA} = 500\,\Omega$$

$$R_C = \frac{V_{RC}}{I_c} = \frac{V_{CC} - V_{CE} - V_E}{I_c} = \frac{(10-5-1)V}{2\,mA} = 2\,k\Omega$$

$$V_B = V_{BE} + V_E = 0.7V + 1V = 1.7\,V$$

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Theme:

$R_2 \leq \beta R_E$

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

$R_2 \leq \frac{1}{10}(110) \times (0.5 K\Omega) = 5.5 K\Omega$

Here,

$V_B = \frac{R_2}{R_1+R_2} V_{CC} \Rightarrow 1.7 V = \frac{(5.5K\Omega)(10V)}{R_1 + 5.5K\Omega}$

$\therefore R_1 = 26.85 K\Omega$

So,

$R_1 = 26.85 K\Omega$

$R_2 = 5.5 K\Omega$

$R_C = 2 K\Omega$

$R_E = 500\Omega$

Theme:

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$R_2 \leq \dfrac{1}{10}(110) \times (0.5\,K\Omega) = 5.5\,K\Omega$

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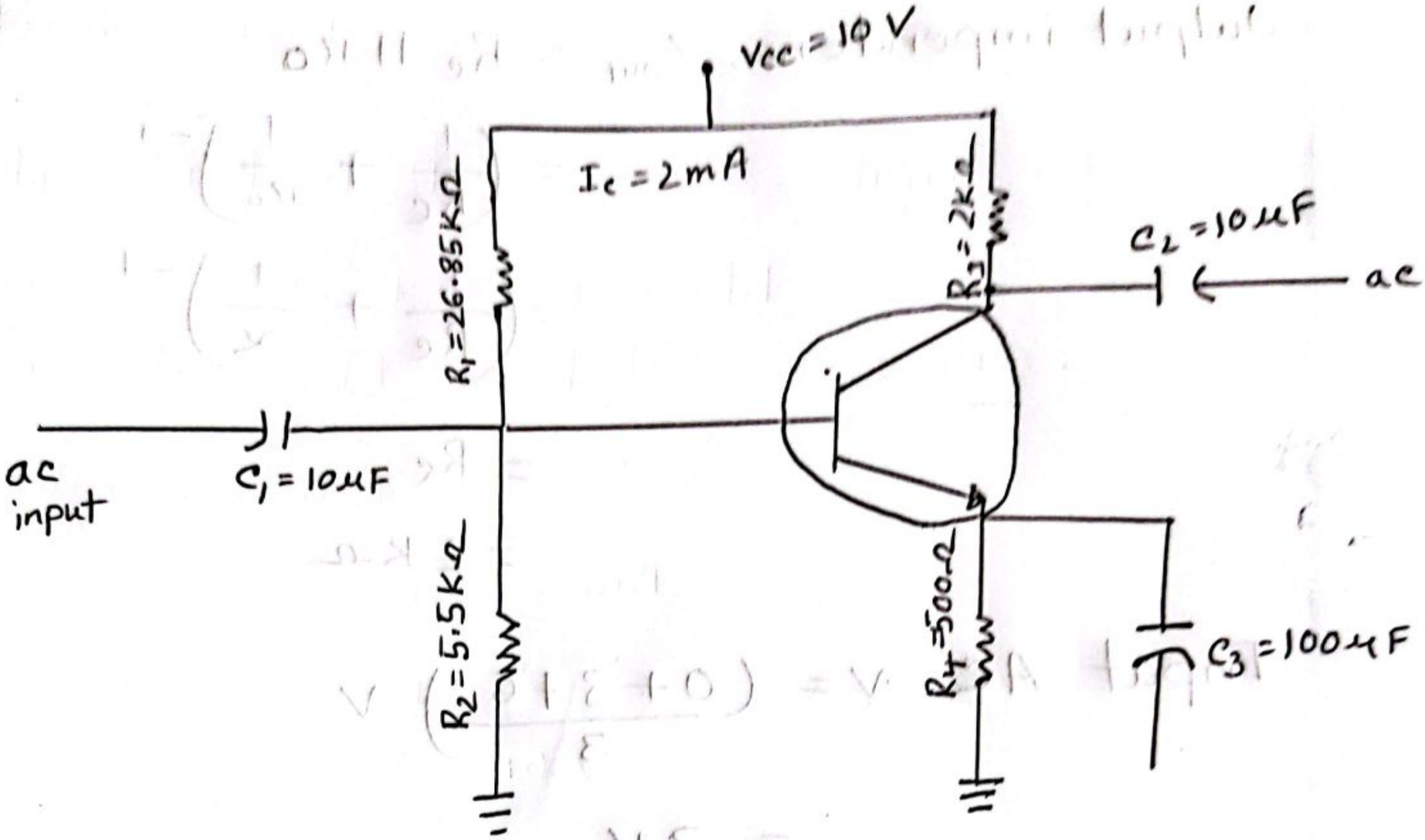
So,

$R_1 = 26.85\,K\Omega$

$R_2 = 5.5\,K\Omega$

$R_C = 2\,K\Omega$

$R_E = 500\,\Omega$



Now, $r_e = \frac{26mV}{I_E} \cong \frac{26mV}{I_c} = \frac{26mV}{2mA} = 13\Omega$

Input impedence, $Z_{in} = R_1 \parallel R_2 \parallel \beta r_e$

$$= \left(\frac{1}{26.85} + \frac{1}{5.5} + \frac{1}{110 \times 13 \times 10^{-3}} \right)^{-1}$$

$$= 1.089\ K\Omega$$

Output impendenc, $Z_{out} = R_c \parallel r_o$

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

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

$$= R_c$$

$$= 2\,k\Omega$$

Input AC $V = \left(\frac{0+3+6}{3}\right) V$

$$= 3V$$