# SOUTHEAST UNIVERSITY

**Assignment on :** BJT Circuit Design

**Course Title :** Electrical Circuit Design 1

**Course Code :** EEE241.7


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15-01-2025

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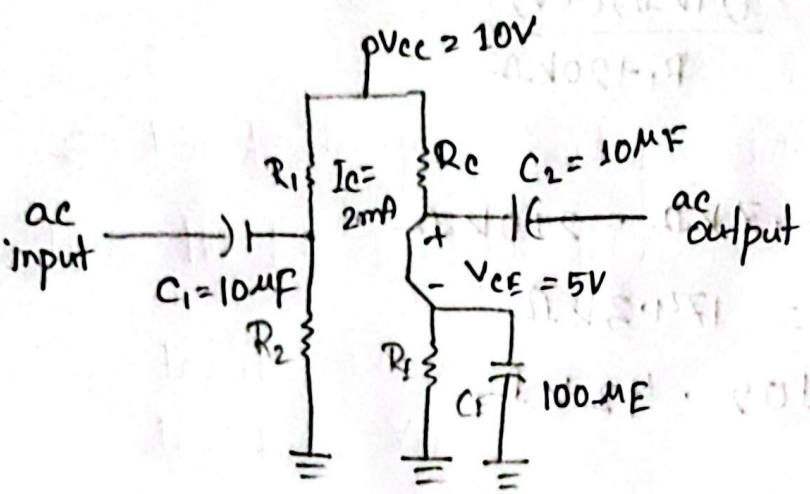
## Problem-01

ID – 006




The last 3 digits of my student ~~account~~ ID 006.

So, sum is = 0+0+6 = 6

The number is even and I need to solve BC547C.

From google $I_C = 2mA$, $V_{CE} = 5V$, $V_{cc} = 10V$, $\beta = 420(min)$

$$\therefore V_E = \frac{1}{10} V_{CC} = \frac{1}{10}(10V) = 1V$$

$$R_E = \frac{V_E}{I_E} \simeq = \frac{1V}{2mA} = 50\Omega$$

$$R_C = \frac{V_{RC}}{I_C} = \frac{V_{CC} - V_{CE} - V_E}{I_C} = \frac{10-5-1}{2mA}$$

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

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

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

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$$R_2 \leq \frac{1}{10}(420) \times (0.5\,k\Omega) = 20\,k\Omega$$

$$V_B = 1.7\,V = \frac{(21k\Omega)(10V)}{R_1 + 20k\Omega}$$

On,

$$1.7R + 35.7k\Omega = 210k\Omega$$

$$1.7R_1 = 174.3k\Omega$$

$$R_1 = 102.42k\Omega$$

$$\therefore R_E = 500k\Omega$$

$$R_C = 2k\Omega$$

$$R_1 = 102k\Omega$$

$$R_2 = 20k\Omega$$

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Problem-2 ID-006

Sum of the last 3 digits = 0+0+6

= 6 ; it's even

So, I've to design 9V relay module,

From the data sheet we get,

$I_{csat} = 50mA$

$I_{csat} = \frac{V_{cc}}{R_c}$

$\Rightarrow 50 \times 10^{-3} = \frac{5}{R_c}$

$\Rightarrow R_c = \frac{5}{50 \times 10^{-3}}$

$\therefore R_c = 100\Omega$

$I_C' = \frac{I_{csat}}{\beta} = \frac{50 \times 10^{-3}}{135}$ | $\beta = 135$

$= 370.37 \mu A$

$I_B > I_B'$

Let,

$I_B = 740.74 \mu A$

$I_B = \frac{V_{cc} - V_{BE}}{R_B}$

$\Rightarrow 740.74 \times 10^{-6} = \frac{5 - 0.7}{R_B}$

$\therefore R_B = 5805\ \Omega$

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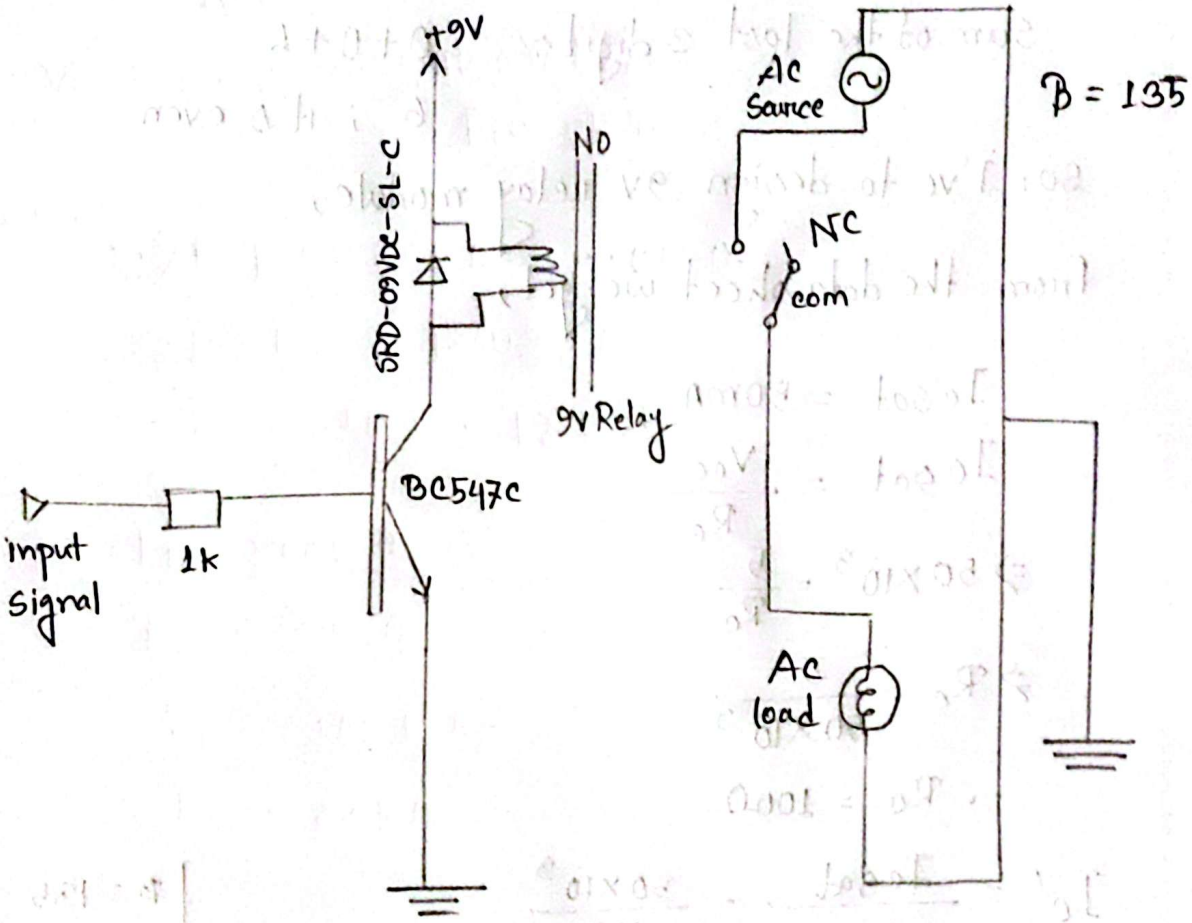


NOTE! Relay model number = SRD-09VDC-SL-C

Resistor values : $R_B = 5805\Omega$, $R_c = 100\Omega$

$V_{cc} = 5V$

P/N names : (i) Signal
(ii) Ground
(iii) $V_{cc}$

JPS