DATE: 9/3/2011

1) The output waveform will look like "cut-off" / "clipped" in the negative part when there is insufficient bias. In this case, the biasing is too low. The transistor does not conduct fully during the negative part of the cycle when the bias voltage is too small. Thus the output is set by the supply voltage.

The amplifier most probably having improper biasing. This could be solved by altering the value of R_1 or R_2. The value of R_1 or R_2 should be increased in order to improve biasing. Hence a undistorted output waveform can be produced.

2) Given $A_v = 100$, At Q point, $I_C = 3mA$, $V_{CE} = 7.5V$, $\beta = 200$.

$I_C = \beta \times I_B$

$\therefore I_B = \frac{I_C}{\beta}$

$= \frac{3mA}{200}$

$= 1.5 \times 10^{-5} A$

Since $I_C \approx I_E$

$r'_E = \frac{25mV}{I_E}$

$= \frac{25mV}{3mA}$

$= 8.33\Omega$

$A_v = \frac{R_L}{r'_E}$

$R_L = A_v \times r'_E$

$= 100 \times 8.33\Omega$

$= 833\Omega$

$r_L = R_C \| R_L$

$r_L = \frac{R_C \times R_L}{R_C + R_L}$

Let $R_C = 1k\Omega$

$833\Omega = \frac{1k\Omega \times R_L}{1k\Omega + R_L}$

$833(1k + R_L) = 1k R_L$

$833k + 833R_L = 1kR_L$

$167R_L = 833k$

$R_L = 4988\Omega$

$V_{CE} = V_{CC} - I_C(R_C + R_E)$

Let $V_{CC} = 15V$,

$7.5V = 15V - 3m(1k + R_E)$

$7.5 = 3m(1k + R_E)$

$1000 + R_E = 2500$

$R_E = 1.5k\Omega$

$V_B = I_E R_E$

$= 3mA \times 1.5k\Omega$

$= 4.5V$

$V_E = V_B - V_{BE}$

$V_B = V_{BE} + V_E$

$= 0.7V + 4.5V$

$= 5.2V$

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

Given : $V_B = 5.2V$, $V_{cc} = 15V$,

Let $R_1 = 1.5k\Omega$

$$5.2V = \frac{R_2}{1.5k\Omega + R_2} \times 15V$$

$$\frac{5.2V}{15V} = \frac{R_2}{1.5k\Omega + R_2}$$

$$5.2(1.5k\Omega + R_2) = 15R_2$$

$$7800\Omega + 5.2R_2 = 15R_2$$

$$9.8R_2 = 7800\Omega$$

$$R_2 = 796\Omega$$

Design :

$V_{cc} = 15V$

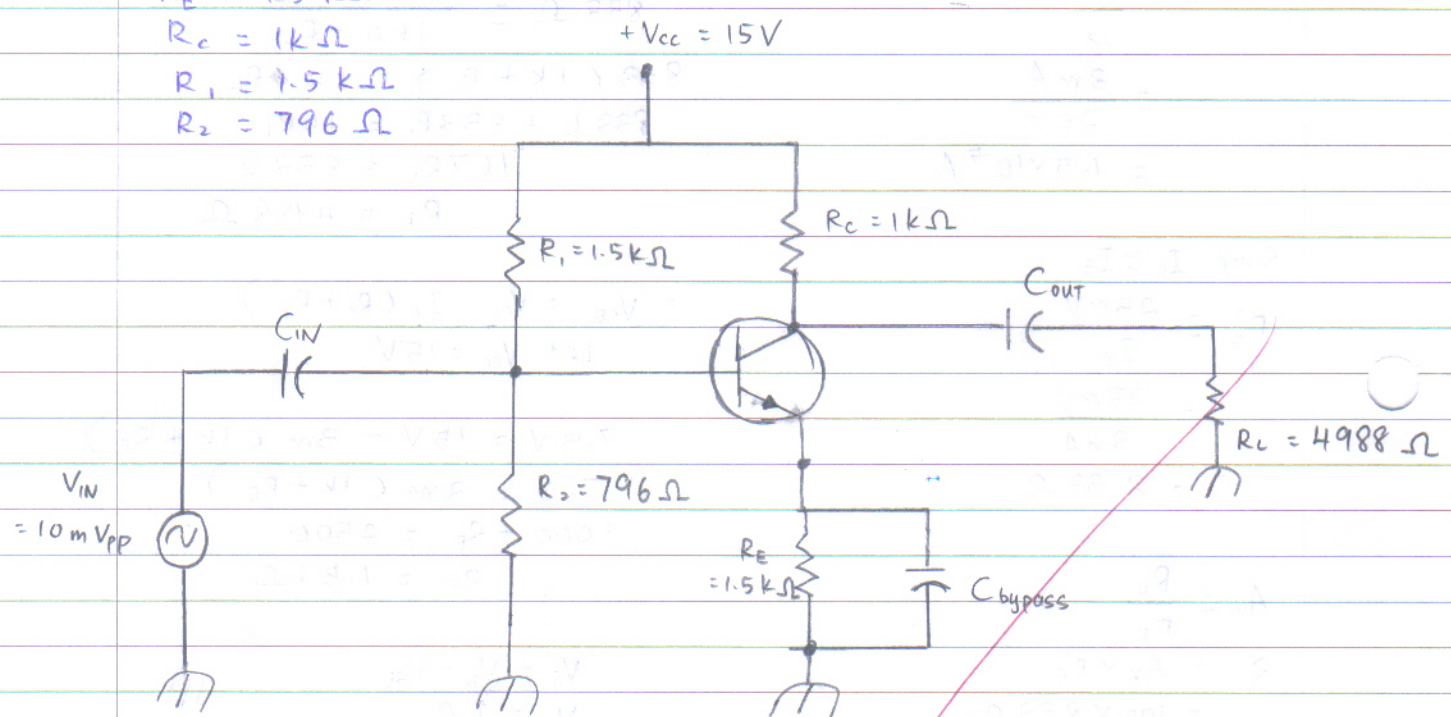
$R_L = 4988\Omega$

$R_E = 1.5k\Omega$

$R_c = 1k\Omega$

$R_1 = 1.5k\Omega$

$R_2 = 796\Omega$



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