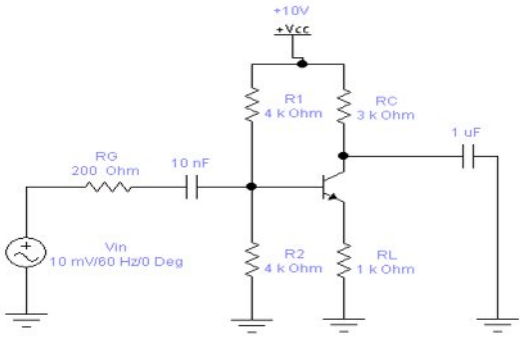
SOAL LATIHAN DAN PENYELESAIANNYA

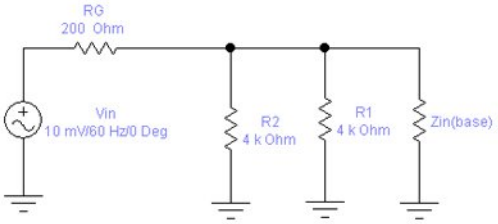
SOAL NOMER 1

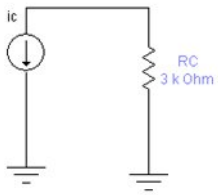


Berapa Av dan Vout dari rangkaian diatas (gunakan model π) jika β=200 dan Vbe=0.7V?

Penyelesaian:

Rangkaian ekuivalen model π





$$V_b = \frac{R1}{R1+R2} x V_{cc}$$

$$V_b = \frac{4K\Omega}{4K\Omega+4K\Omega} x10V$$

$$V_b = \frac{4}{8} x10V = 5V$$

$$V_E = V_b - V_{be} = 5V - 0.7V = 4.3V$$

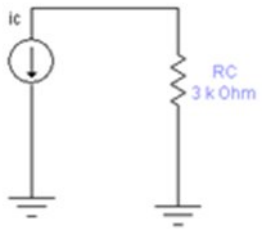
$$I_E = \frac{V_E}{R_E} = \frac{4.3V}{1K\Omega} = 4.3mA$$

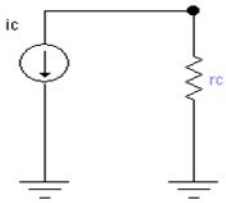
$$re' = \frac{25mV}{I_E} = \frac{25mV}{4.3mA} = 5.8\Omega$$

$$Z_{in(base)} = \beta re' = 200.(5.8\Omega) = 1160\Omega$$

$$Z_{in(stage)} = R1 \,||\, R2 \,||\, Z_{in(base)} = 0.73K\Omega = 730\Omega$$

$$V_{in}' = \frac{Z_{in(stage)}}{RG + Z_{in(stage)}} V_{in} = \frac{200\Omega}{200\Omega+730\Omega} 10mV = 2.15mV$$





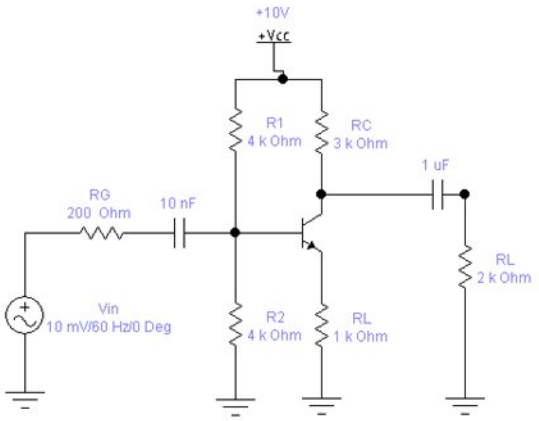
ekuivalen

$$r_c = RC = 3K\Omega$$

$$A_v = \frac{r_c}{re'} = \frac{3K\Omega}{730\Omega} = 4.1kali \approx 4kali$$

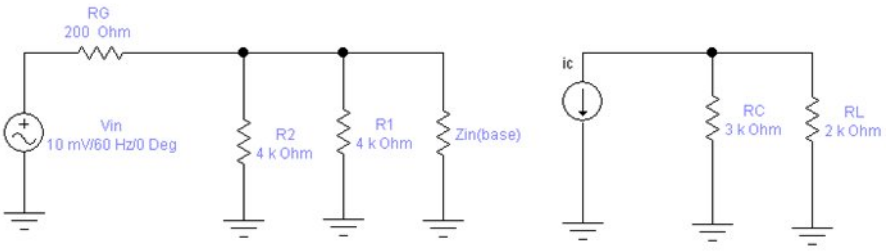
$$V_{out} = A_v x V_{in} = 4.(2.15mV) = 8.6mV$$

Soal nomer 2



Berapa Av dan Vout dari rangkaian diatas (gunakan model π dan model T) jika β=200 dan Vbe=0.7V?

Rangkaian ekuivalen ac



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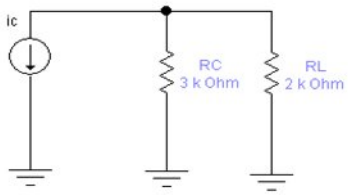
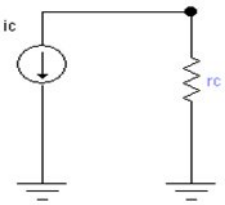




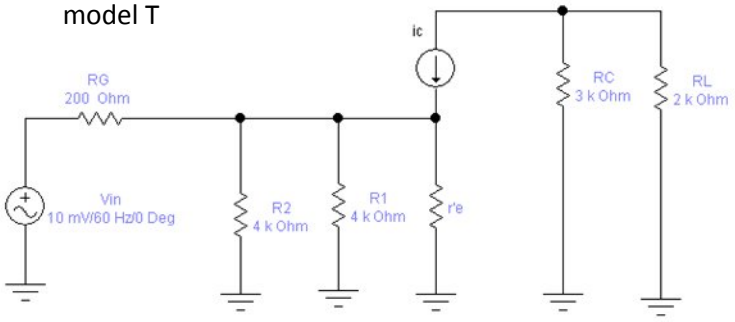
ekuivalen

$$r_c = RC \,||\, RL = 1.2K\Omega$$

$$A_v = \frac{r_c}{re'} = \frac{1.2K\Omega}{730\Omega} = 1.6kali \approx 2kali$$

$$V_{out} = A_v x V_{in} = 2.(2.15mV) = 2.3mV$$

Rangkaian ekuivalen AC
model T



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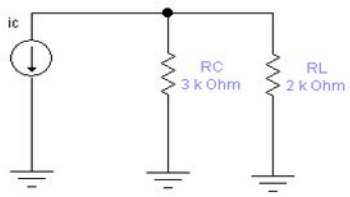
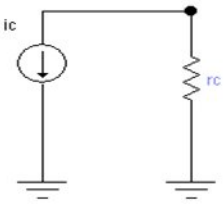




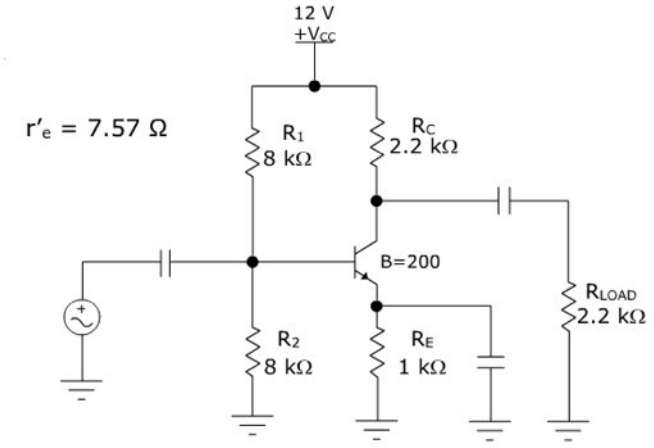
ekuivalen

$$r_c = RC \parallel RL = 1.2K\Omega$$

$$A_V = \frac{r_c}{re'} = \frac{1.2K\Omega}{730\Omega} = 1.6kali \approx 2kali$$

$$V_{out} = A_V x V_{in} = 2.(2.15mV) = 2.3mV$$

Soal nomer 3



Tentukan Zin(base), Zin, Av dan Vout jika Vin=5 mv?

$$Z_{in(base)} = \beta r'e = 200(7.57\Omega) = 1514\Omega$$

$$Z_{in(stage)} = R1 \,||\, R2 \,||\, Z_{in(base)} = 1090\Omega$$

$$Av = \frac{rc}{r'e}$$

$$rc = R_C \,||\, R_L = 1.1K\Omega$$

$$Av = \frac{1.1K\Omega}{7.57\Omega} = 145.3kali \approx 145kali$$

$$Vout = Av.Vin = 145(5mV) = 725mV$$

Dikarenakan tidak ada hambatan pada tegangan input AC yang akan masuk ke kaki Basis, maka nilai Tegangan Input sebelum dan sesudah melewati kaki basis sama besar.

Jika kita menghitung menggunakan model T, maka penguatan dan Vout akan sama nilainya jika menggunakan model π. Perbedaannya hanya pada perhitungan Impedansi. Di Analisis Mosel T tidak mempertimbangkan adanya impedansi, sehingga hasil perhitungan sebagai berikut:

$$Av = \frac{rc}{r'e}$$

$$rc = R_C \,||\, R_L = 1.1K\Omega$$

$$Av = \frac{1.1K\Omega}{7.57\Omega} = 145.3kali \approx 145kali$$