1- Consider an amplifier circuit using a BJT having $Is = 10^{-15}A$, a collector resistance R = 6.8 KΩ, and a power supply V_{cc} = 10 V. Determine the value of the bias voltage V_{BE} required to operate the transistor at V_{CE} =3.2 V. What is the corresponding value of I_C?

2- The transistor in Fig. 1 is biased with a constant current source I = 1 mA and has β = 100 and V_A = 100 V.
(a) Find the dc voltages at the base, emitter, and collector.
(b) Find g_m, r_π , and r_o.
(c) If terminal Z is connected to ground, X to a signal source v_{sig} with a source resistance R_{sig} = 2 kΩ, and Y to an 8-kΩ load resistance, use the hybrid-π model, to draw the small-signal equivalent circuit of the amplifier. Calculate the overall voltage gain v_y /v_{sig}.

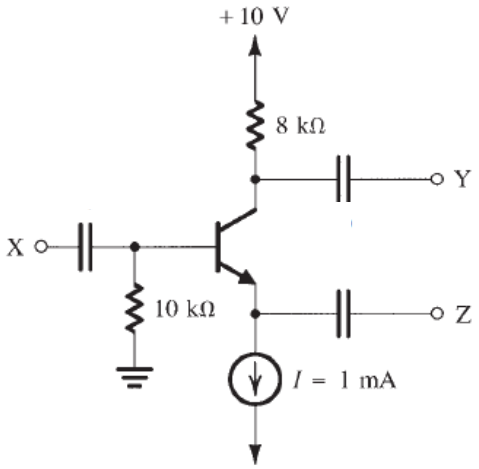

Fig.1

3- The amplifier circuit in Fig. 2 has the following parameters: R_C= 1KΩ, R_2= R_{F1}= R_{F2}= 20KΩ, R_S= 10KΩ, r_π= 1KΩ, β= 100, and r_o=∞.
a) Draw the small-signal equivalent circuit.
b) Determine the voltage gain.

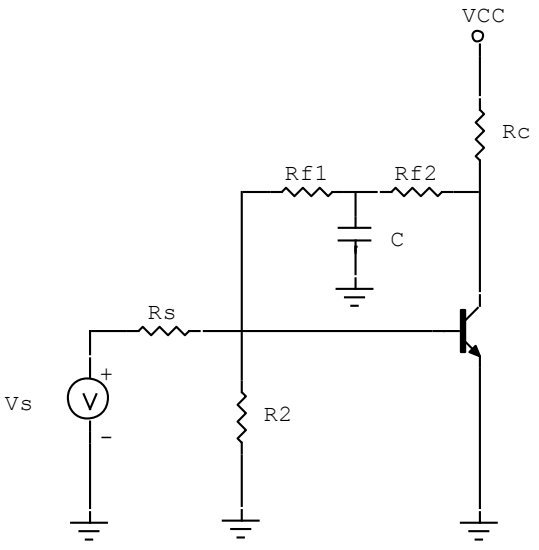

Fig.2

4- For the common-emitter amplifier shown in Fig. 3, let V_{CC} = 15 V, R_1 = 27 kΩ, R_2 = 15 kΩ, R_E = 2.4 kΩ, and R_C = 3.9 kΩ. The transistor has β = 100. Calculate the dc bias current I_C. If the amplifier operates between a source for which R_{sig} = 2 kΩ and a load of 2 kΩ, replace the transistor with its hybrid-π model, and find the values of R_{in}, R_o, A_{vo}, A_v and the overall voltage gain G_v (v_o/ v_{sig}).

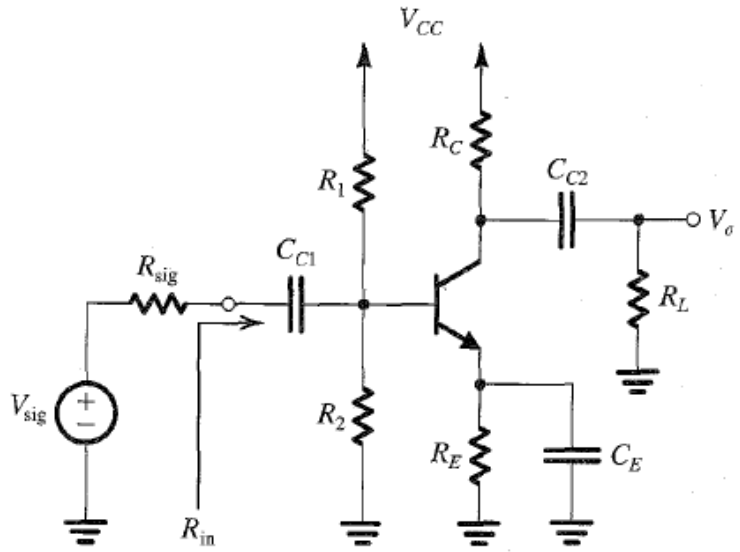

Fig. 3

5- For the common-emitter amplifier with an Emitter resistance shown in Fig. 4. Find the equations of R_{in}, R_o, A_{vo}, A_v and the overall voltage gain G_v (v_o/ v_{sig}).

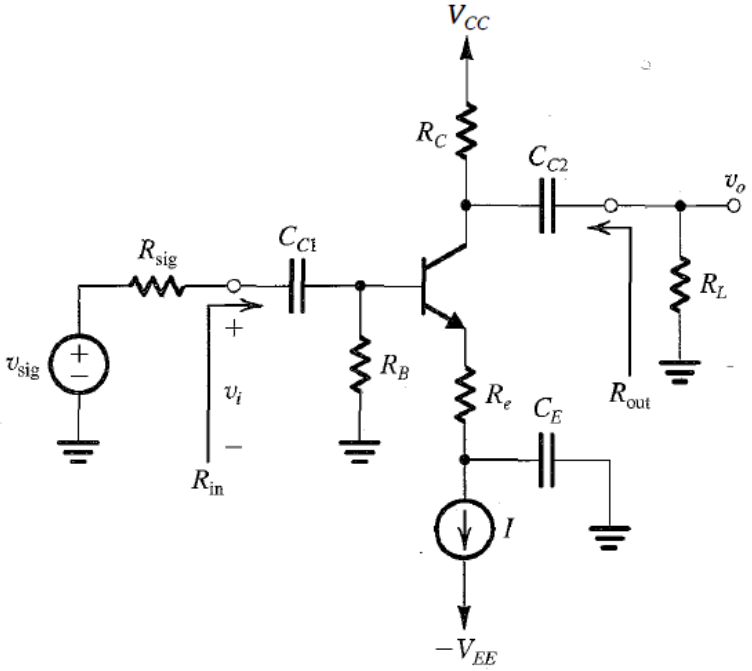

Fig. 4

6- In the circuit shown in Fig. 5, the transistor has a β of 200. What is the dc voltage at the collector? Find the values of R_{in}, R_o, and the overall voltage gain (v_o/ v_{sig}). For an output signal of ±0.4 V, what value of v_{sig} is required?

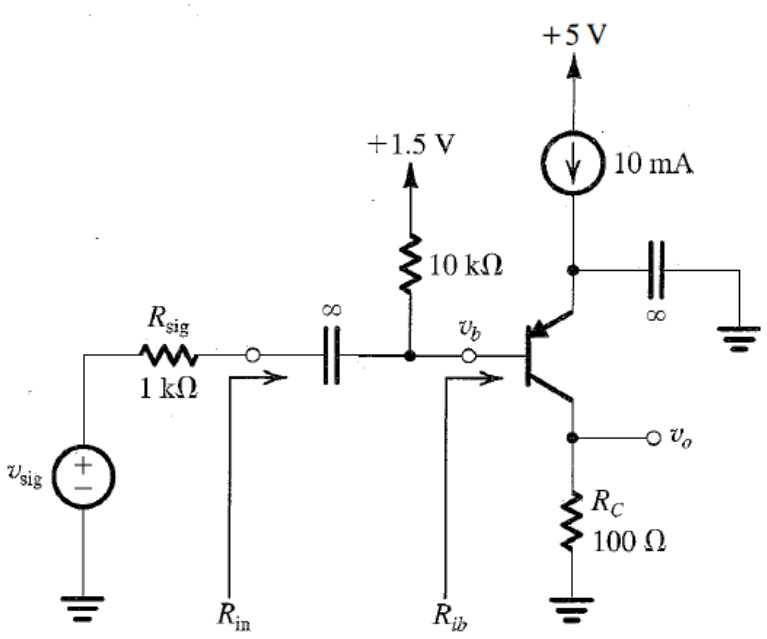

Fig. 5

7- For the Common-Base (CB) amplifier shown in Fig. 6, if , R_S= 100 Ω, R_E = 4.3 *K*Ω, R_C= 2.2 *K*Ω, R_L = 51 *K*Ω and β = 100. What are the overall voltage gain v_o/v_{sig}, input resistance and output resistance of the amplifier if the DC operating collector current (I_C = 1mA).

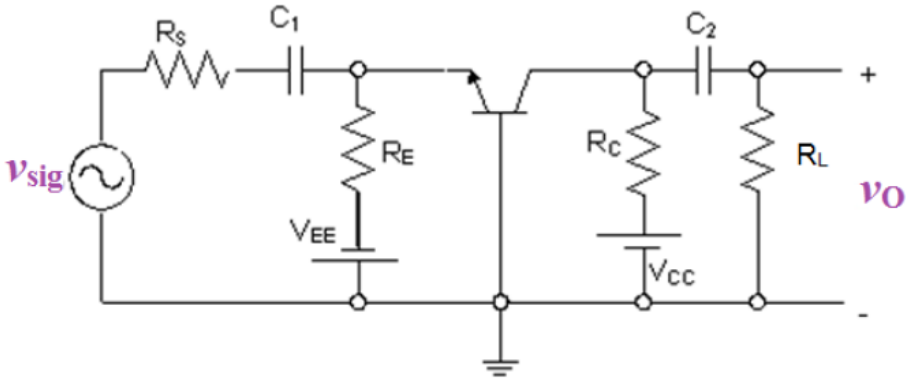

Fig. 6

8- For the Common-Collector amplifier shown in Fig. 7:
R_S= 2 *K*Ω, R_1 = 100 *K*Ω, R_2= 300 *K*Ω, R_3 = 13 *K*Ω, R_4 = 100 *K*Ω, β = 100 and I_C = 0.25mA. Find the input resistance, output resistance and the overall voltage gain v_{out}/v_{sig}?

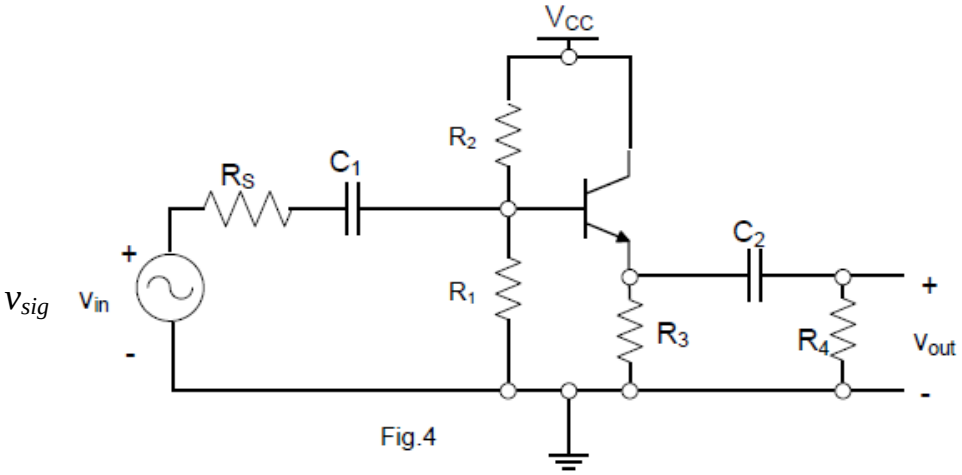

Fig. 7

9- For the circuit shown in Fig. 8, draw a complete small-signal equivalent circuit utilizing an appropriate T model for the BJT (use α= 0.99). Your circuit should show the values of all components, including the model parameters. What is the input resistance R_{in}? Calculate the voltage gain (v_o/ v_{sig}).

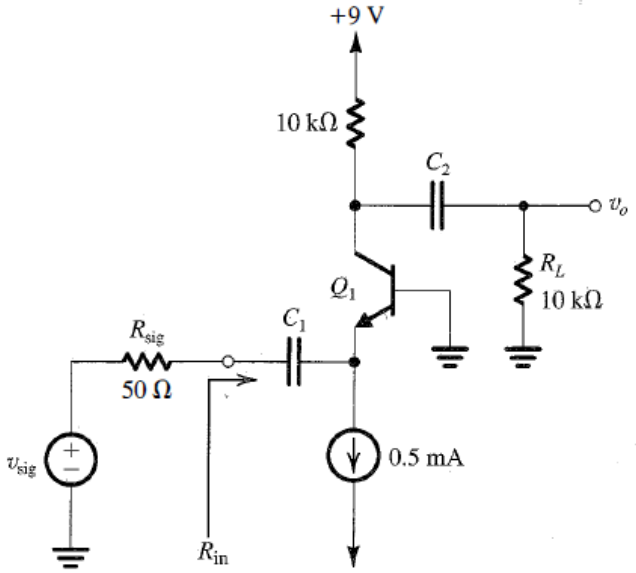

Fig.8

Best Wishes *Dr. Eman F. Sawires*

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