1. The truth table for an exclusive-or gate is given below in the figure.

| A	B	Y
0	0	0
1	1	0
0	1	1
1	0	1
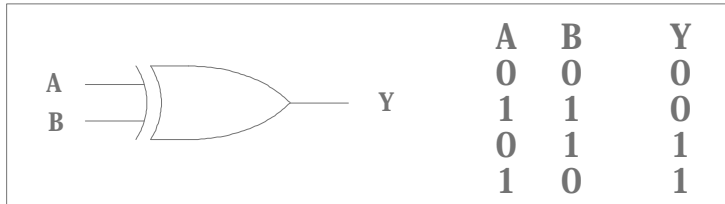
a. Draw a logic circuit using AND gate(s), OR gate(s), and inverter(s) to implement this function.

b. Draw an equivalent circuit made entirely from NOR gates.

2a. Calculate the collector current for the circuit below, assuming that this current is 99 times the base current and that the base-to-emitter voltage is 0.7

b. Calculate the emitter current.

c. Calculate the power dissipated by the transistor.

8V

10k

Vbe = .7
Ic/Ib= 99

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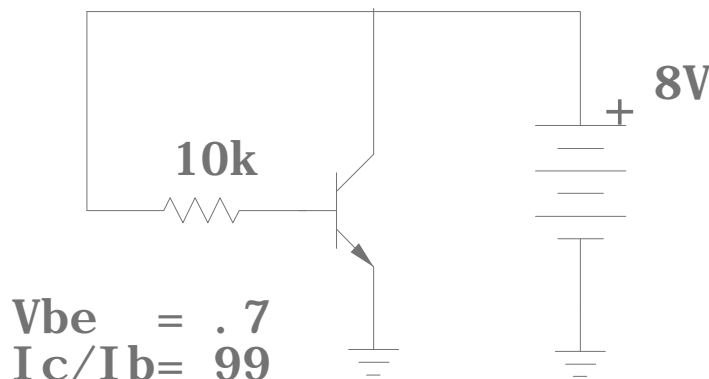
3. a. Calculate the collector current for the circuit below, assuming that this current is 99 times the base current and that the base-to-emitter voltage is 0.7.
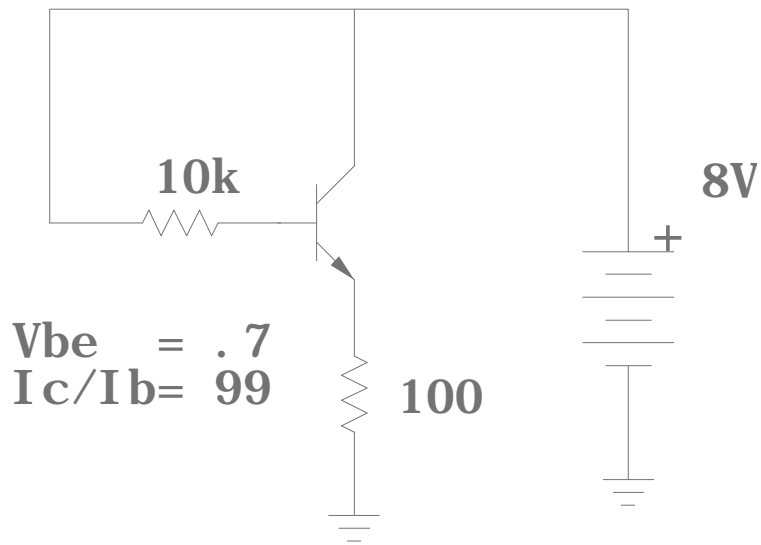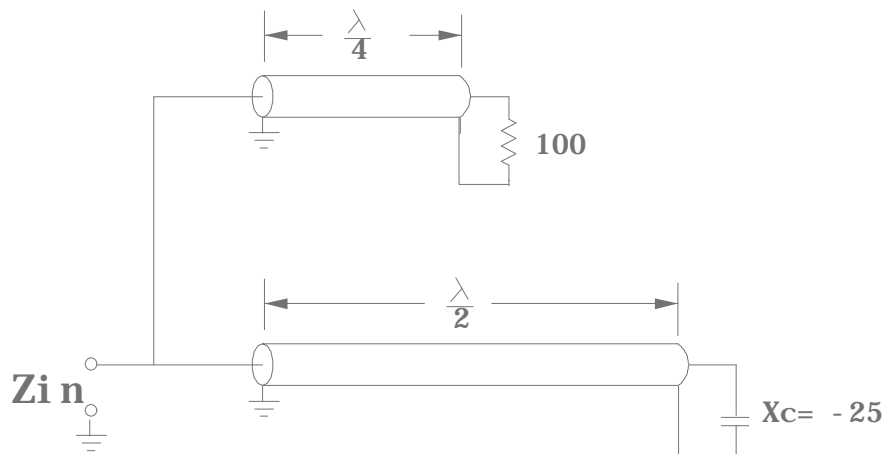
b. Calulate the power dissipated by the transistor.

10k

8V
+

Vbe = .7
Ic/Ib= 99   100

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4. Calculate the impedance, $Z = R + jX$, of the circuit shown below, for the frequency at which the transmission lines (Zo = 50) have electrical lengths of lambda/4 and lambda/2, as indicated.

$\frac{\lambda}{4}$

100

$\frac{\lambda}{2}$

Zin

Xc= -25

5. The circuit below contains an ideal op amp.

a. Find the value of the voltage gain, Vout/Vin, for very low frequencies.

b. Find the value of the voltage gain for very high frequencies.

c. Derive an expression for the voltage gain for an arbitrary frequency, .

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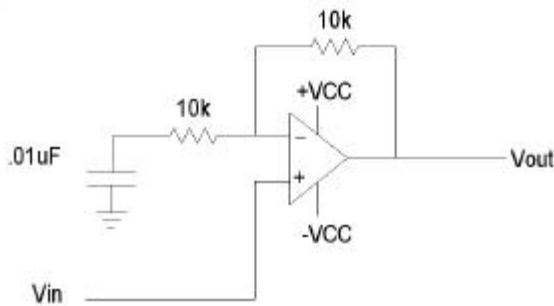
6. The circuit below is the output stage of an audio amplifer. For simplicity, assume that for both transistors, Vbe=0 and that the speaker is equivalent to a 4 Ohm resistor. If the amplifier is delivering a 32-watt (avg. power) sine wave to the speaker, find

a. the peak-to-peak voltage value of Vin.

b. the power dissipated by the transistors as heat.
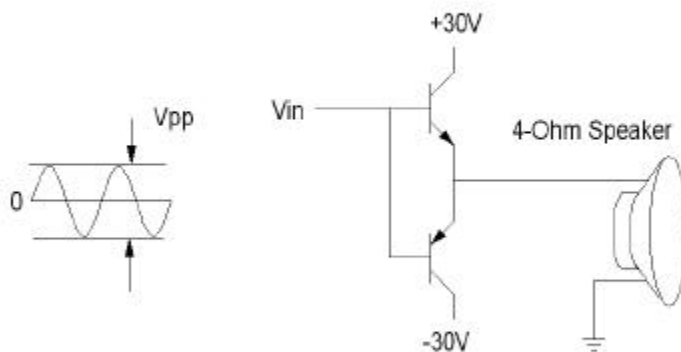
7. A particular amplfier has a noise figure of 8 dB and a gain of 6dB. If a 3 dB attenuator is connected to the amplfier input and a 4 dB attenuator is connected to the output, what is the noise figure of this 3-component cascade?

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8. A certain Yagi antenna, working at a wavelength of 3m, has a gain of 12 dB and is radiating 1 watt in the direction of a identical antenna at a distance of 10 km. The receiving antenna is properly aligned to extract the maximum signal. Both antennas are in free space where no objects or ground will modify the wave propagation. How much power can be extracted from the receiving antenna?

10 December 02