Midterm Exam
ENEE 306
Fall 2004

Part I (65). The following questions refer to the circuit in Fig. 1. Take β =200 and V_{BE}=0.7V for DC operation. V_T = 26mV. Approximate capacitors to be open circuits for DC, an short circuits for AC. You can neglect r_π and g_m in your calculations if you want.

1. What are the DC voltages at the collector and emitter of the BJT?
2. If an AC signal of V_{in} (t)=0.5sin(2π x 10^6t)V is applied to the input, provide an expression for the signal at the output.
3. Sketch the voltage versus time at the input, the base, the collector and at the output for one period. Include both DC and AC parts. Label your graphs with appropriate numbers.

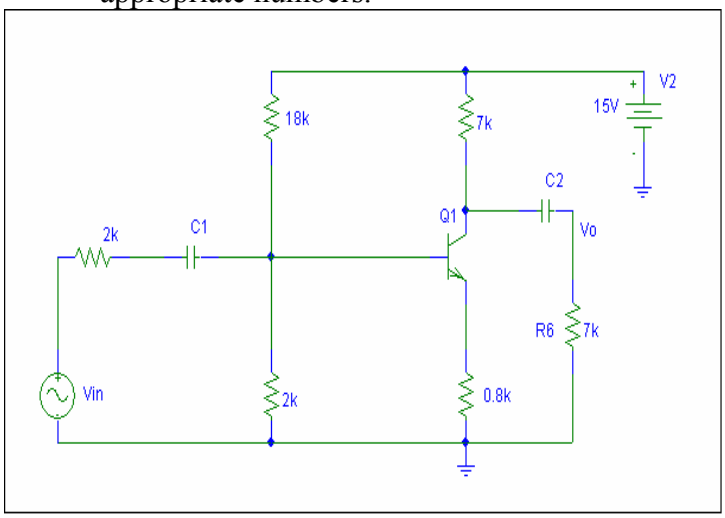


Figure 1

4. The circuit has been modified by removing the 2k source resistor, and the coupling capacitor C1, as shown in Fig. 2. Using approximate methods, sketch the output versus time for this new configuration for the following 2 input signals:
   V_{in} (t)=0.5sin(2π x 10^6t)V and for V_{in} (t)=1.0 sin(2π x 10^6t)V

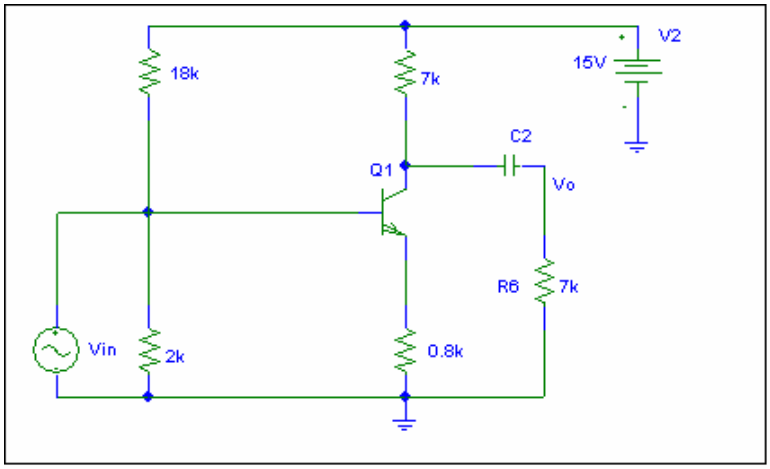


Figure 2

Part II (35). The following questions refer to the circuit in Fig. 3. Take β =200, V_{BE}=0.7V, and V_{in} (t)=10.7 sin(2π x 10^6t)V.

1. Sketch the output and input voltage signals versus time for one period. On the graphs indicate whether the transistors are on or off, and when. Label your graphs with appropriate numbers.
2. What is the purpose of this circuit?
3. Sketch the output if a 0.1K (100 ohm) resistor is connected from Vo to ground. (Hint. Calculate the output resistance of the circuit.)

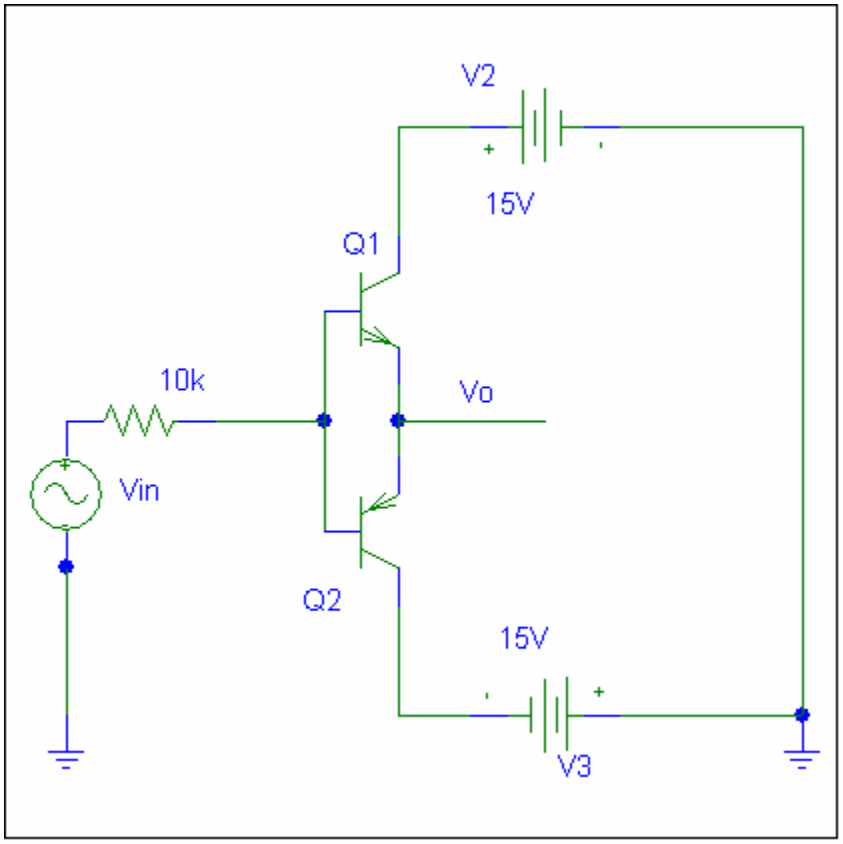


Figure 3