American University of Beirut  
Department of Electrical and Computer Engineering

EECE 310 – Electronics Fall 2011 – 2012

*Due Wednesday January 11, 2012 at 9:00 am*

**Homework 10**

**1. [20 points]** Consider the BJT circuit shown in Figure 1.

a) Find the minimum value of the collector voltage [10 points], such that the BJT remains in the active region. Assume ** = 150.

b) Find the value of *R*C [10 points] needed to get a collector voltage half-way between the value calculated in part (a) and *V*CC = +12V.

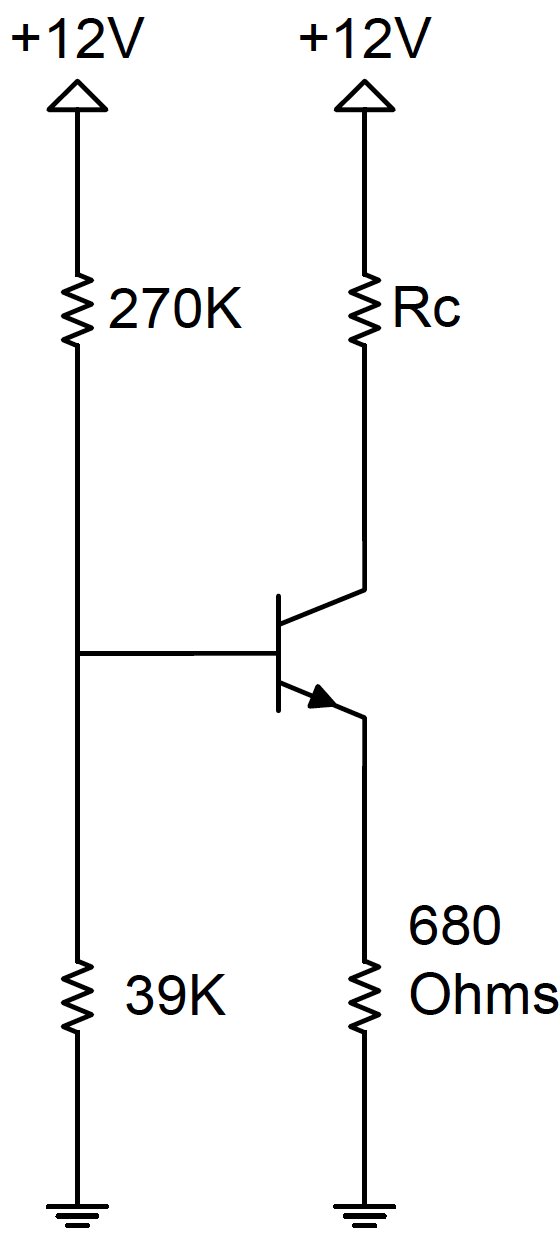


Figure 1

**2.**  **[80 points]** For the circuit shown in Figure 2, the BJT has ** = 160 and *V*A = 80 V.

Assume that *V*T = 26 mV and that all capacitors are very large.

a) Find the DC values of *I*B [5 points], *I*C [5 points], and *V*CE [5 points]. *Neglect* the Early effect in DC analysis.

b) Find the small-signal parameters *g*m [2 points], *r*[2 points], *r*e [2 points], and *r*o [2 points].

c) Find the small-signal voltage gain of the amplifier, *v*o/*v*i [12 points].

d) Find the largest allowable signal swing (peak-to-peak) at the collector to satisfy the two conditions: BJT remains active [5 points], and *v*be limited to 5 mV [5 points]. What is the corresponding allowable peak-to-peak input voltage *v*i [5 points]?

e) Verify the results of parts (c) and (d) using PSpice [30 points]. Use the Q2N2222 part number for the BJT (available in the eval library).

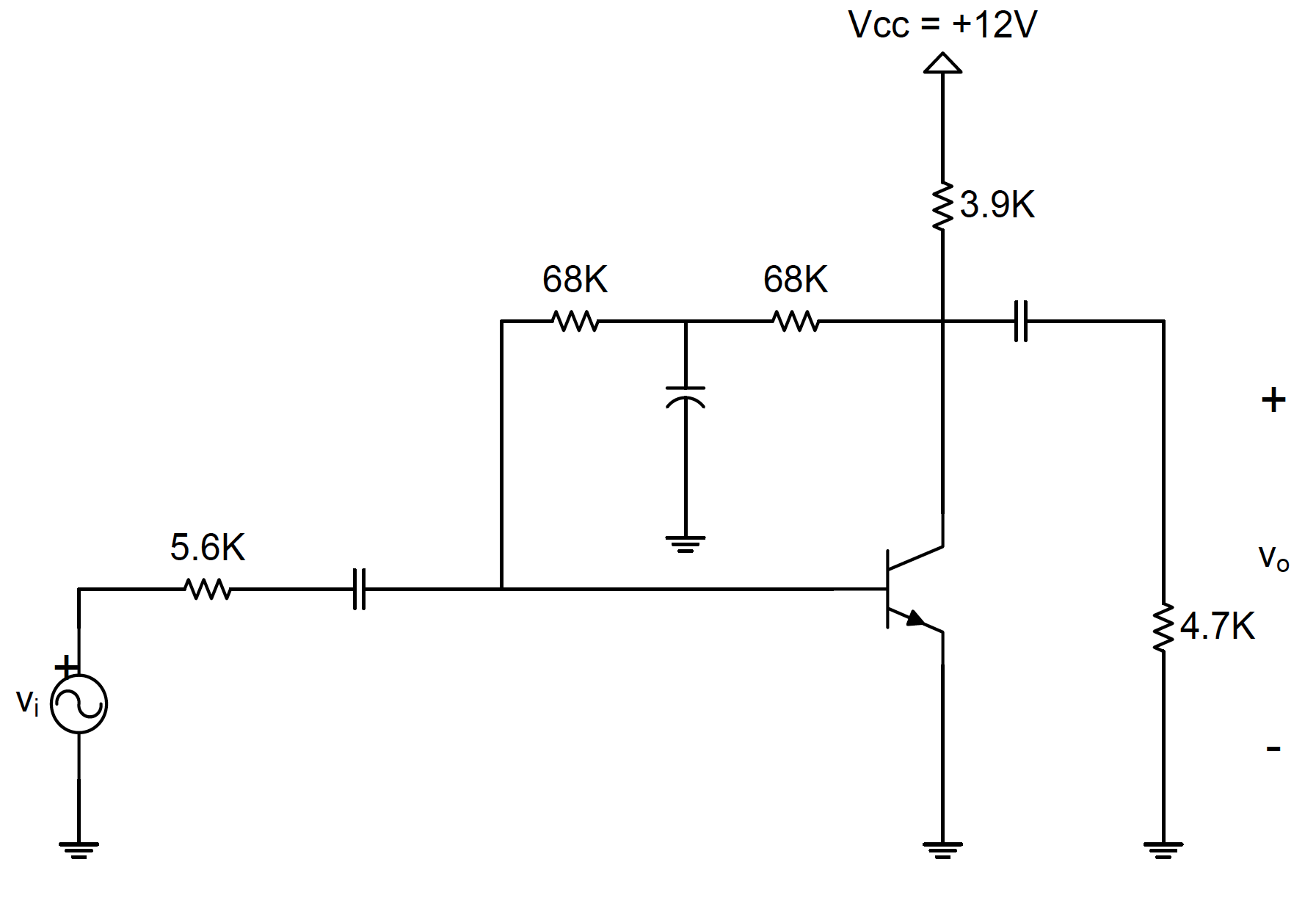


Figure 2