PHYS 328 Mid-term Test

Thursday, November 8, 2007

Instructions:
Attempt all questions; all questions have the same weight.
No notes or books are allowed.
Calculators may be used.
This test comprises 3 questions.

1. (a) Plot the output voltage vs time for the left-hand circuit shown in the figure for the input shown in the same figure. Label important points like maximum and minimum values and discontinuities. (Use the simple, idealized diode model with a 0.6 V forward voltage drop.)
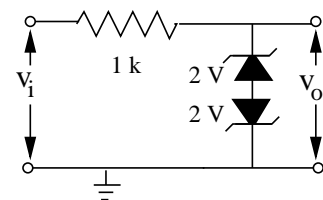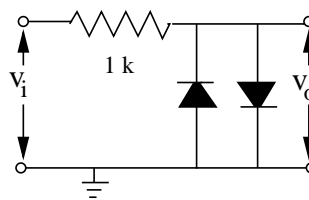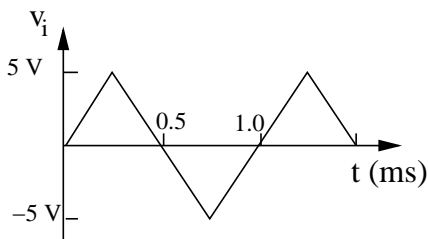

(b) Repeat part (a) for the right-hand circuit which uses Zener diodes with a breakdown voltage of 2 V.

2. Referring to the circuit below, design a phase splitter that has the inverted output ($\overline{V_o}$) twice as large as the non-inverted output (V_o). The non-inverted output should have unity gain ($V_0 \simeq V_{in}$).

  Assume $V_{cc} = 20$ V and $\beta = 100$.

  Bias the quiescent points to permit the largest possible swings on the outputs.

  Make R_E large enough that r_e is negligable.
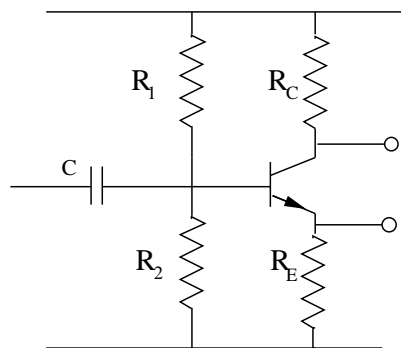
3. (a) At what frequency will an op-amp with slew rate of 0.5 V/μs be limited to an output sine wave amplitude of 5 V?

(b) Show that the circuit below represents a differential amplifier with gain G=R/r.