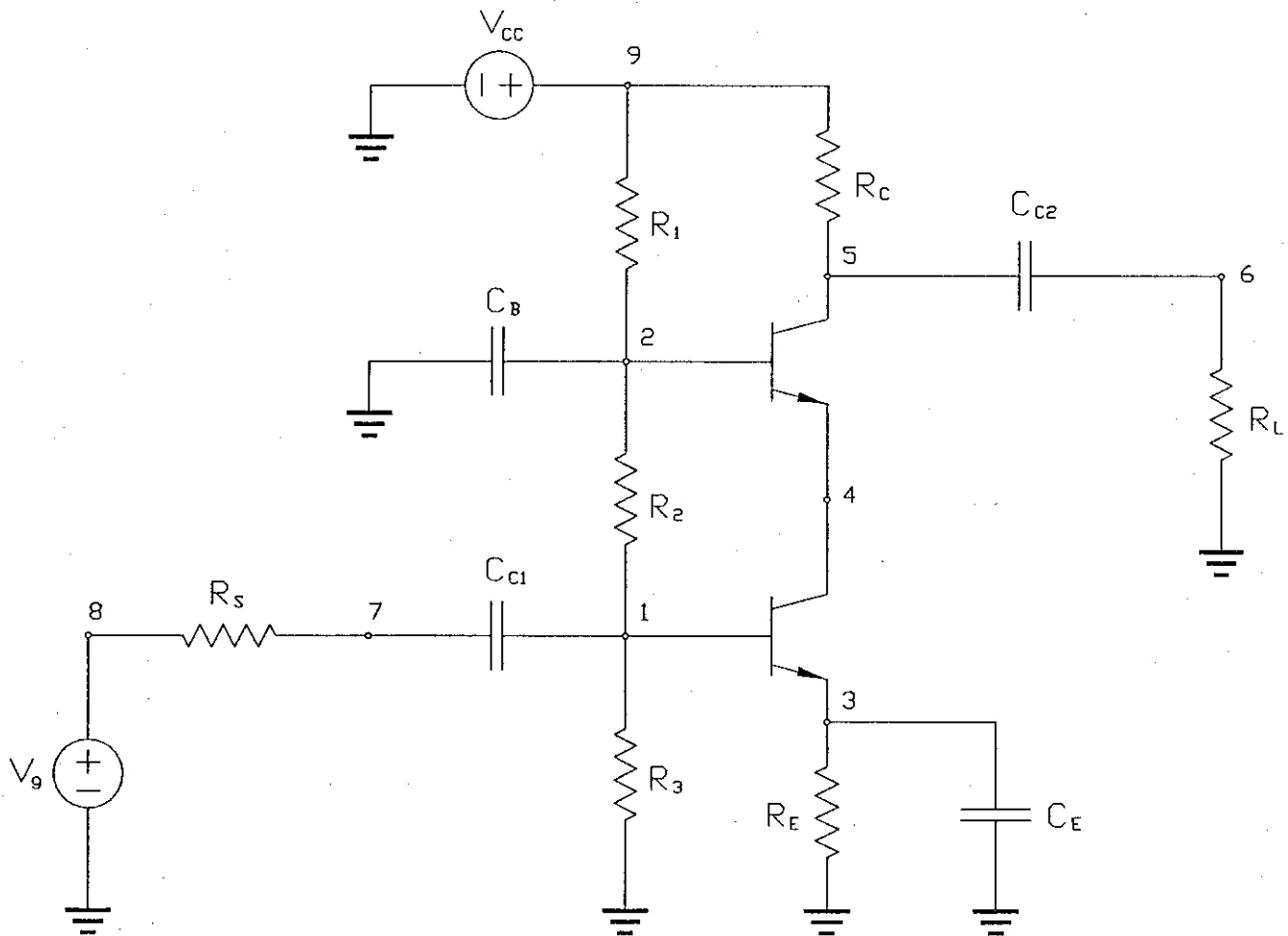


## PROJECT # 4: DC Analysis of Nonlinear Circuits

The circuit below represents the same *cascode amplifier* that was considered in Project # 3.



This time, however, we will be interested in the DC analysis of this circuit.

### PROBLEM 1.

Formulate the circuit equations for DC analysis. Indicate  $G$ ,  $p(x)$  and  $w$  explicitly.

## PROBLEM 2.

Write an m - file that will solve the DC equations using Newton's method. The input arguments for this function should be the *initial approximation*  $x_0$ , matrix  $G$ , and a *convergence criterion*. The output should be the *solution vector*, and the *number of iterations* that were needed for convergence. Your function should therefore look something like this:  $[x, iter] = bjtdc(x_0, G, e)$ .

## PROBLEM 3.

Perform an *approximate* DC analysis of the circuit to obtain a good initial guess for the solution. Show this approximate solution explicitly.

## PROBLEM 4.

Use the function developed in Problem 2 and the initial guess from Problem 3 to compute the *exact* DC solution. Set the convergence criterion for Newton's method to be  $e = 10^{-9}$ , and record the number of iterations that was needed.