EECS 42 – Introduction to Electronics for Computer Science

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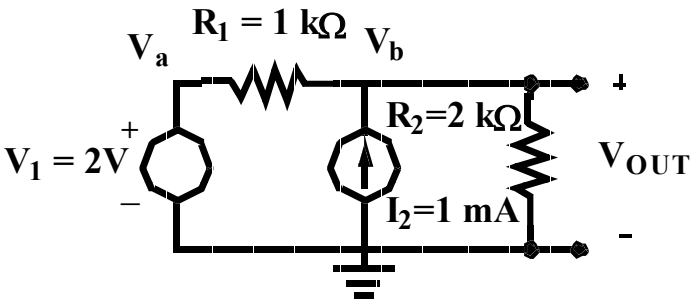
Quiz #1 February 26, 2003

Show your work so that the method can be graded for correctness and completeness and all of the points do not depend on just the final numerical value.

I (20 Points) Basic Circuit Analysis

a) For the circuit shown find V_b.



$$\frac{V_1 - V_{OUT}}{R_1} + I_2 - \frac{V_{OUT}}{R_2} = 0$$

$$(2mA + 1mA) = V_{OUT} / (R_1 \parallel R_2)$$

$$V_{OUT} = 3mA \cdot (2/3)k\Omega = 2V$$

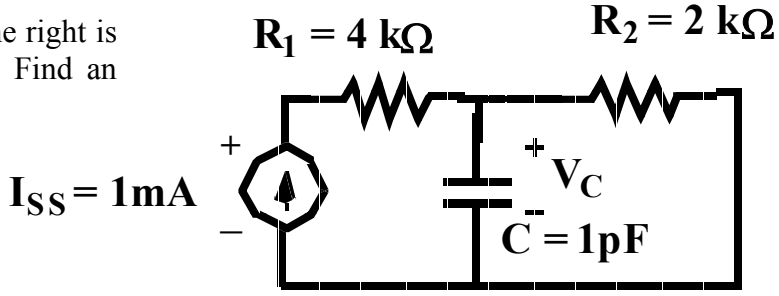
b) Find the Thevenin resistance seen looking into the output terminals.

$$R_{TH} = R_1 \parallel R_2 = (2/3)k\Omega$$

Grading:
8 pts KCL (-3 first error, -3 second error)
4 pts solution (2V)
8 pts V_{TH} (2 pts if one of two resistors)

II (20 Points) Transient Analysis

The current source in the circuit to the right is is turned from 0 to 1 mA at t = 0. Find an equation that describes $V_C(t)$.



$V_{INITIAL}$ = 0 as R2 would discharge C.

V_{FINAL} = 1mA x 2kΩ = 2V

R_{TH} = R2 = 2kΩ

τ = 2kΩ x 1pF = 2 ns

$$V_C(t) = A + Be^{-t/\tau} = 2V - 2Ve^{-t/2ns}$$

Grading:
6 V_{FINAL} or Equation correct

6 $V_{INITIAL}$ or Equation Correct

8 time constant correct (2 if R other than R1)