Quiz #1 September 26, 2001

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 $V_b$.

No current in the output. $I_2$ goes through $R_1$.

$$ V_b = V_1 + I_2R_1 = 2V + (1\text{mA})(1\ \text{k} \Omega) $$

$$ = 2V + 1V = 3V $$

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

Turn $V_1$ to zero = short; Turn $I_2$ to zero = open

See $R_2$ in series with $R_1$

$$ R_{\text{THEVENIN}} = R_1 + R_2 = 3 \text{ k} \Omega $$

II (20 Points) Transient Analysis

The switch in the circuit to the right is opened at $t = 0$. Find and equation that describes $V_C(t)$.

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

$$ V_C(0) = \text{Voltage Divider} = V_S \frac{R_2}{(R_1+R_2)} $$

$$ = 6 \frac{(2\text{k} \Omega)/(4\text{k} \Omega+2\text{k} \Omega)) = 2V = A + B $$

$$ V_C(\text{infinity}) = V_S = 6V = A $$

Time constant $\tau = R_1C = 4\text{k} \Omega \cdot 1\text{pF} = 4 \text{ ns}$

$$ V_C(t) = 6V - 4e^{-t/4\text{ns}} $$