# EECS 42 – Introduction to Electronics for Computer Science

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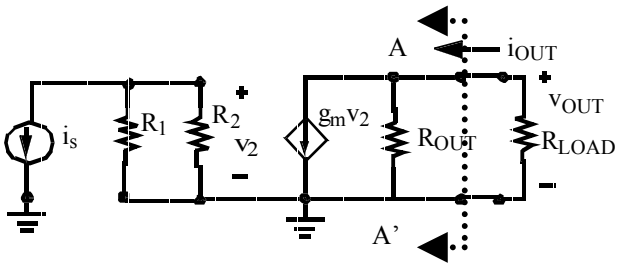
# Solutions Quiz #1 October 31, 2001

**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) Standard Dependent Sources

a) (13 Points) For the circuit shown find $i_{OUT}/i_s$.




$$V_2 = -i_s(R_1 \parallel R_2)$$

$$V_{OUT} = -g_m V_2 (R_{OUT} \parallel R_L)$$

$$i_{OUT} = -\frac{V_{OUT}}{R_L}$$

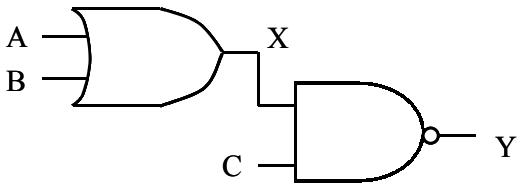
$$\frac{i_{OUT}}{i_s} = -g_m \frac{(R_1 \parallel R_2)(R_{OUT} \parallel R_L)}{R_L}$$

b) (7 Points) Find the Thevenin resistance seen looking to the left of AA'.

The independent source $i_s$ is turned to zero. This makes $v_2$ zero and in turn $g_m v_2$ is zero. Thus only $R_{OUT}$ remains and is the Thevenin resistance.

## II (20 Points) Logic Gates

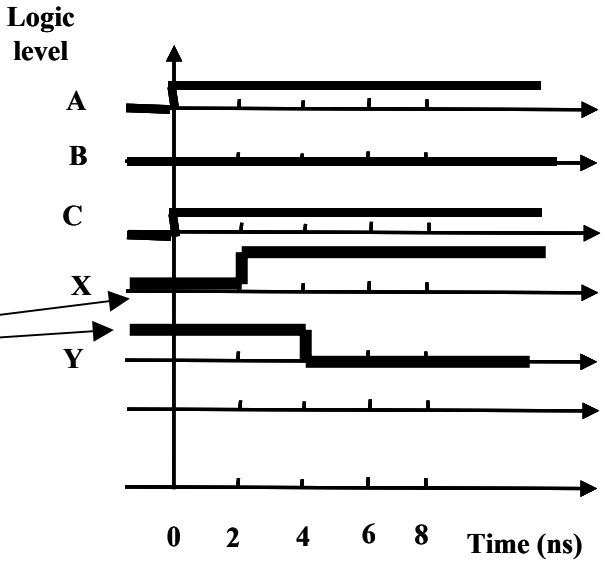
Inputs A, B, and C have all been zero (low) for a long time and then at t = 0, A and C go to (high) for a long time.




a) (8 Points) Find the values of X and Y just before t = 0, and then as t goes to infinity.

Before t = 0, X = A + B = 0 + 0 = 0
Y = (X*C)Bar = (0*0)Bar = 0Bar = 1
As approach infinity, X = A + B = 1 + 0 = 1
Y = (X*C)Bar = (1*1)Bar = 1Bar = 0

b) Complete the timing diagram below assuming that each gate has a propagation delay of 2 ns before the correct output appears at its output.




Signal added