EECS 42 – Introduction to Electronics for Computer Science

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Midterm #1 March 5th, 2003

Closed Book, Closed Notes
Write on the Exam paper

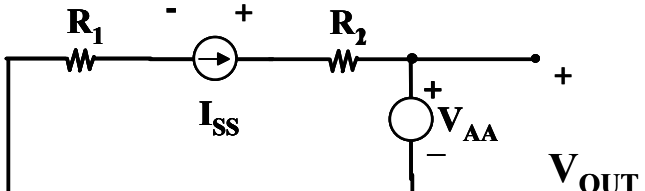
Print Your Name:_____

Sign Your Name:_____

Show your work so that the method as well as the answer can be graded for correctness and completeness. Correct answers alone are only worth 70% of full credit.

Problem	Possible	Score
I	28	
II	22	
III	25	
IV	25	
Total	100	

I (28 Points) Basic Circuit Analysis



V_{AA} = 2V I_{ss} = 1 mA

R_1 = 1kΩ R_2 = 2kΩ R_3 = 3kΩ

a) (7 points) Find R_{TH}.

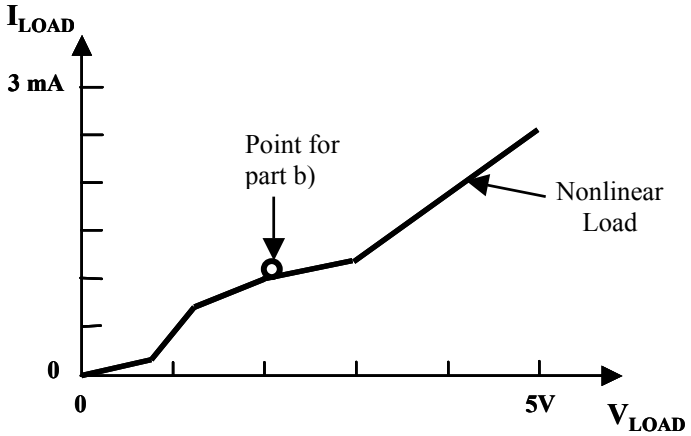
b) (7 points) Find V_{OC}.

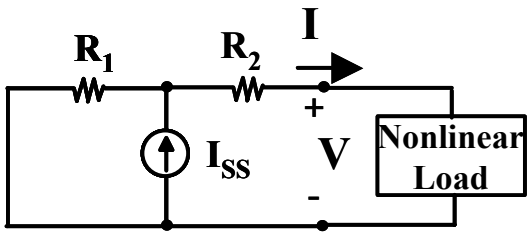
c) (7 points) Find the power delivered to the circuit by V_{AA}.

d) (7 points) Find the voltage on the current source I_{SS} in the direction shown on the diagram.

II (22 Points) Load Lines

A linear circuit is connected to a nonlinear load.





R_1 = 1 kΩ R_2 = 2 kΩ
I_{SS} = 4 mA

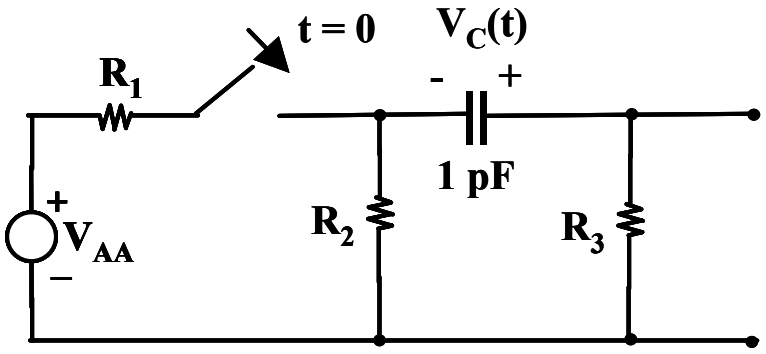
a) (12 points) Find the combination of current I and voltage V that satisfies both the circuit and the load.

b) (10 points) Adjust R_2 so that the solution passes through the point indicated on the device curve.

III (25 Points) Transient

The switch in the circuit closes at t = 0. Just before switching the capacitor is charged to 2V.

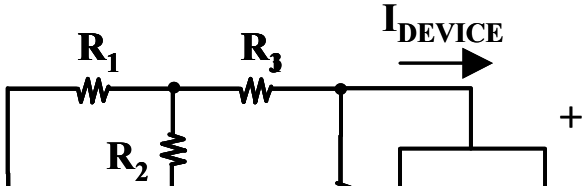
a) (18 points) Find the voltage on the capacitor $V_C(t)$ for $t > 0$.



$R_1 = 1k\Omega$ $R_2 = 2\ k\Omega$ $R_3 = 3\ k\Omega$
$V_{AA} = 5\ V$

b) (7 points) Find $dV_C(t)/dt$ just prior to the switch closing at t = 0.

IV (25 Points) Node Equations



a) (15 points) Assign labels to the nodes and write a complete set of node equations for determining the node voltages. (These equations should contain only the node voltages themselves, resistances, source strengths and the device current.)

R_1 = 1kΩ R_2 = 2 kΩ R_3 = 3 kΩ R_3 = 3 kΩ
V_{AA} = 5 V I_{SS} = 1 mA

b) (10 points) Use **one** of your node equations from above to find the voltage on I_{SS} when the voltage on the device is 2V. (Hint: Substitute the device voltage to break the equations apart to avoid excessive algebra).