Department of Electrical Engineering and Computer Sciences
College of Engineering
University of California, Berkeley

SR Sanders Spring 2002

EECS40 - Midterm #1
Feb. 26, 2002

Name: ___Solutions_____ **SID#** _____
Last, First

Signature: _____ **TA**:

Guidelines

1. Closed book, except 2 sheets of your own notes.
2. You may use a calculator.
3. Do not unstaple the exam.
4. Show all your work and reasoning on the exam to receive full or partial credit.
5. The exam has 4 problems.

Problem	Points possible	Your score
1	**20**	
2	**20**	
3	**30**	
4	**30**	
total		

1. Consider the Boolean expression:

$$F = (X + \overline{Y})\,(Y + Z)$$

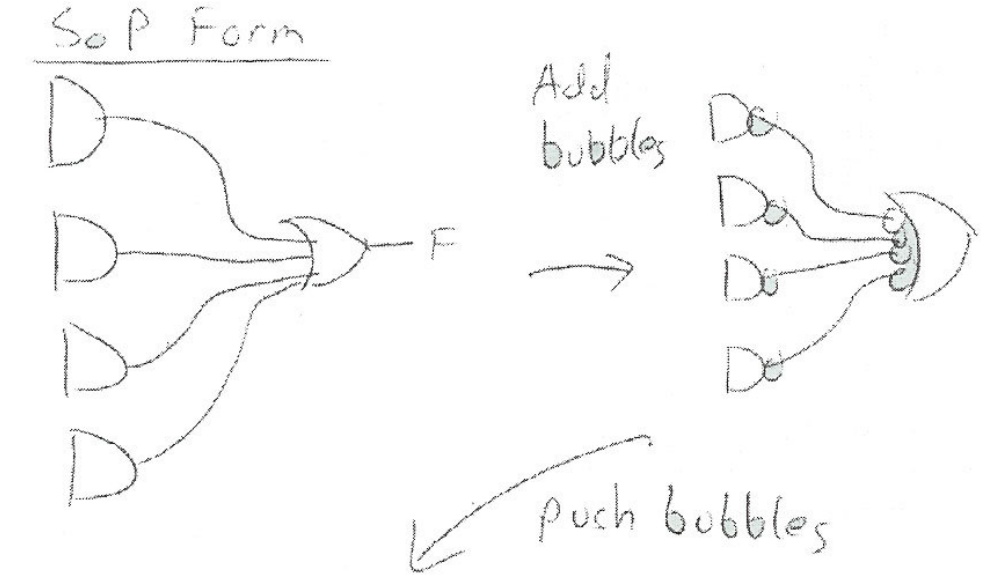
(10) a) Write a truth table for this expression.

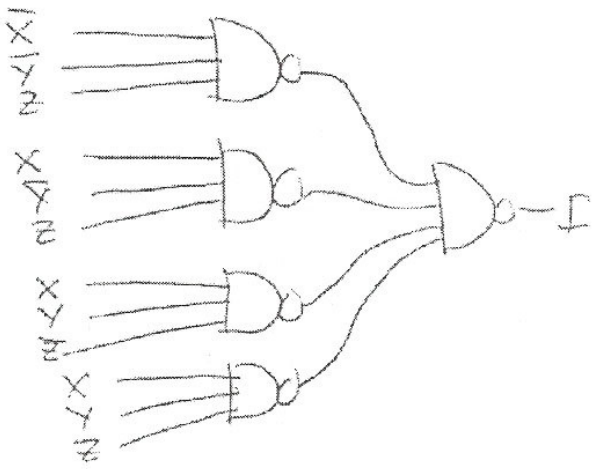
X	Y	Z	F
0	0	0	**0**
0	0	1	**1**
0	1	0	**0**
0	1	1	**0**
1	0	0	**0**
1	0	1	**1**
1	1	0	**1**
1	1	1	**1**

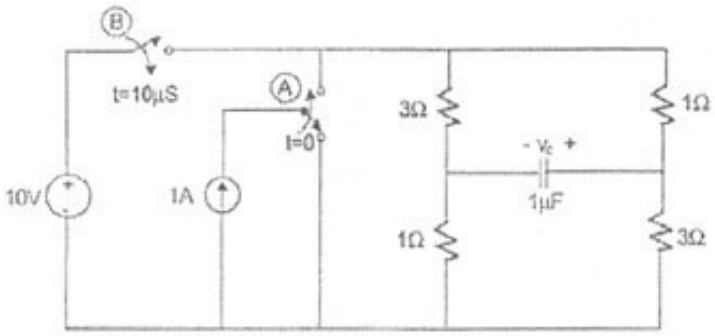
(10) b) Express F in sum of products form. Do not simplify.

$$\mathbf{F = \overline{X}\,\overline{Y}Z + X\overline{Y}Z + XY\overline{Z} + XYZ}$$

(10) c) Draw a realization for your expression in (b) using NAND logic.

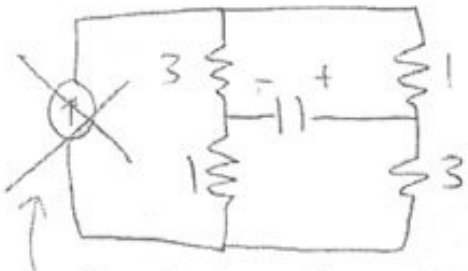




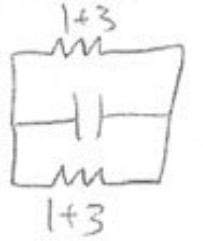


The circuit shown here is at equilibrium with $v_c = 0$ at $t = 0$. At $t = 0$, switch A is moved as shown in the diagram. Then at time $t = 10\mu S$, switch B is closed.

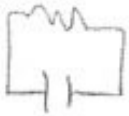
(6) a) For time $0 < t < 10\mu S$, determine the circuit time constant.



For Finding Req, Set Sources to Zero



4//4 = 2



$RC = (2\Omega)(1\mu F)$

$= 2\mu s$

(6) b) Determine an expression for the capacitor voltage for time $0 < t < 10\mu S$.

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

$A = V_F$

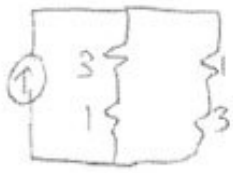
$B = V_I - V_F$

$V_I = 0$

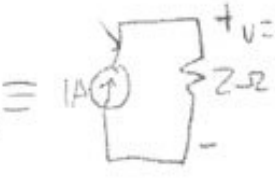
$V_F = 1$

$V(t) = 1 - 1e^{-t/2\mu s}$

Find V_F

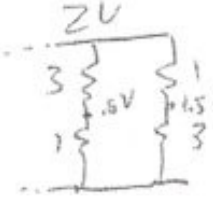


$\equiv$



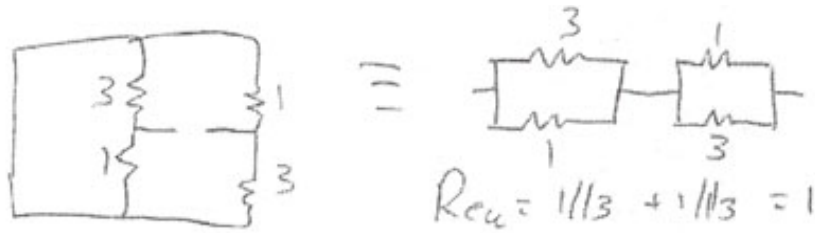
$+V = IR = 2V$

7



$V_c = 1.5 - .5 = 1 = V_F$

(6) c) For time t > 10 μS, determine the circuit time constant.



(6) d) Determine an expression for the capacitor voltage $v_c(t)$ for t > 10 μS.

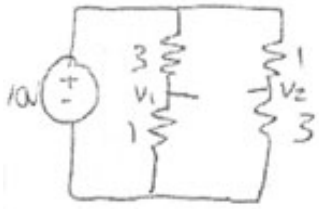
$V_I = 1 - e^{-(10\mu s/2\mu s)} \approx 1$

$V_F = 5V$

$A = V_F = 5V$

$B = V_I - V_F = 1 - 5 = -4V$

$V_{c(t>10\mu s)} = 5 - 4e^{-\frac{(t-10\mu s)}{1.5\mu s}}$



$V_1 = 10V\left(\frac{1}{1+3}\right) = 2.5$

$V_2 = 10V\left(\frac{3}{1+2}\right) = 7.5$

$V_c = V_2 - V_1 = 7.5 - 2.5 = 5V = V_F$

(6) e) Graph v_c (t) for t > 0 on the axes below.