Exam #1

84/100

Cp Eng 111, Section B
Fall 1999

Name: Jesse Klein

Section —

9/17/99

Show all work on the exam papers. If you need additional space, use the reverse side of the paper.
Closed book, closed notes, no calculator.

pts.

(12) 1. (a) Convert 10101.01 from binary to decimal equivalent.

$4\,3\,2\,1\,0\,{}^{-1}\,{}^{-2}$

$(1\times2^4)+(1\times2^2)+(1\times2^0)\cdot(1\times2^{-2}) = (16+4+1)\cdot 1\times\frac{1}{4}$

21.25 ✓

(b) Convert 33.6875 to binary.

100001.1011

$\frac{33}{2}=16\ r_0=1$ $\frac{8}{2}=4\ r_2=0$ $\frac{1}{2}=0\ r_5=1$

$\frac{16}{2}=8\ r_1=0$ $\frac{4}{2}=2\ r_3=0$ $.6875\cdot2=1.375$ $r_{-1}=1$

$\frac{2}{2}=1\ r_4=0$ $.375\cdot2=.75$ $r_{-2}=0$

$.75\times2=1.5$ $r_{-3}=1$

$.5\times2=1$ $r_{-4}=1$

9
A 10
B 11
C 12
D 13
14
15

(c) Convert 0x AF to decimal.

$(10\times16^1)+(15\times16^0)=$ 175 ✓

(d) Convert the binary number 1101011010 to hexadecimal.
(reminder: you do not need a calculator.)

0011 0101 1010 = 35A ✓

3 5 10

(9) 2. The octal number system is the base 8 system.

(a) What single digits would be used in base 8 (octal) ?

0, 1, 2, 3, 4, 5, 6, 7 ✓

(b) What decimal number does 100_8 represent?

$2\,1\,0$

$(1\times8^2)+$ = 64 ✓

(c) Convert 0x FF to base 8. (reminder: you do not need a calculator.)

$FF = (15\times16^1)+(15\times16^0) = 255$

377 ✓

512 64 8 1

$15\cdot8^1$ 15

$30\cdot8^2$ $30\cdot8^1$

Name: Jesse Lee

pts.
(10) 3. A clock has a period of 200 *ns*. Find its frequency.

$$f = \frac{1}{T} = \frac{1}{200 \times 10^{-9}\,s} = 5{,}000{,}000\,\frac{1}{s} = \boxed{5\,MHz}$$

$$\frac{1}{200\ ns} = \frac{1005 \times 10^{9}}{5 \times 10^{6}}$$

(16) 4. Determine whether each of the following is True (T) or False (F); circle the appropriate choice.

(a) $\overline{abc} = \bar{a}\,\bar{b}\,\bar{c}$ T (F)

(b) $\overline{x+\bar{y}+\bar{z}} = \bar{x}\,y\,z$ (T) F

$\bar{x}\,y\,z$

(c) $x + xy = x$ (T) F

$A + AB = A$

(d) $a + \bar{a}b = \bar{a} + b$ T (F)

$a + \bar{a}b = a + b$

a	b	$\bar{a}$	$\bar{a}b$	b	$a + b$
0	0	1	0	0	0
0	1	1	1	1	1
1	0	0	0	0	1
1	1	0	0	1	1

$A \cdot A \cdot B$ $\quad \bar{B}(1+A)$

$\bar{B}+A \quad \in ((\bar{A}+B)$ **Name:** Jesse Lee

pts.

(14) 5. (a) Simplify the function

$$f(A,B,C) = (A+\bar{B}+A\bar{B})(AB+\bar{A}C+BC)$$

$$(\bar{B}(A+1)+A)(AB+\bar{A}C+BC)$$

$$(\bar{B}+A)(AB+\bar{A}C+BC)$$

$\bar{B}+(A+1)$ $\quad -3$

$A+\bar{B}$

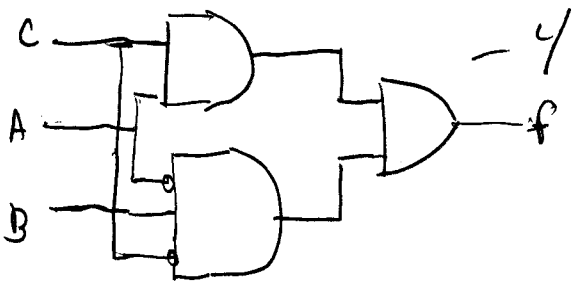
$AC + \bar{A}B\bar{C}$ X ← using K map on reverse page

$AB + \bar{A}\bar{B}C$

A

$B + A\bar{B} = B + A$

(b) Draw a logic circuit to implement the simplified form of function f.



-4

-7

(18) 6. (a) Generate the truth table for $g(A,B,C) = AC + \bar{A}\bar{B}$

A	B	C	g	AC	$\bar{A}$	$\bar{B}$	$\bar{A}\bar{B}$
0	0	0	1 ✓	0	1	1	1
0	0	1	1 ✓	0	1	1	1
0	1	0	0 ✓	0	1	0	0
0	1	1	0 ✓	0	1	0	0
1	0	0	0 ✓	0	0	1	0
1	0	1	1 ✓	1	0	1	0
1	1	0	0 ✓	0	0	0	0
1	1	1	1 ✓	1	0	0	0

SOP ✓

(b) Write g as a canonical sum of products.

$g(A,B,C) = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C + ABC$ ✓

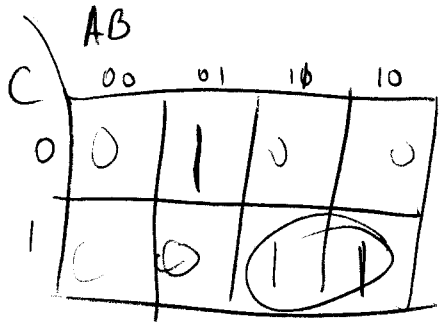
AB	C	
0	0	0
0	1	1
0	0	2
		3
0	0	4
0	1	5
1	0	6
1	1	7

(c) If $F(x,y,z) = \sum m(0,1,2,5,6)$, write F as a product of sums (*POS*).

$= \Pi M(3,4,7)$ ✓

$F(x,y,z) = (A+\bar{B}+\bar{C})(\bar{A}+B+C)(\bar{A}+\bar{B}+\bar{C})$

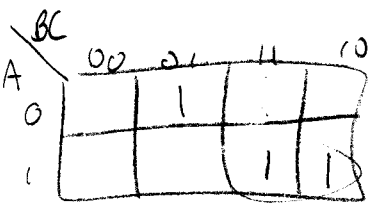
A	B	C	$\bar{B}+A$	AB	$\bar{A}C$	BC		f	
0	0	0	1	0	0	0	0	0	0
0	0	1	1	0	1	0	1	1	1
0	1	0	0	0	0	0	0	0	2
0	1	1	0	0	1	1	1	0	3
1	0	0	1	0	0	0	0	0	4
1	0	1	1	0	0	0	0	0	5
1	1	0	1	1	0	0	1	1	6
1	1	1	1	1	0	1	1	1	7



$\bar{A}\bar{B}\bar{C}$

AC

$AC + \bar{A}B\bar{C}$



$AB + \bar{A}\bar{B}C$

$(\cancel{AB\bar{B}} + \bar{A}\bar{B}C + \bar{B}\cancel{BC})$

$+ \quad AAB + \cancel{\bar{A}AC} + ABC$

$\bar{A}\bar{B}C + AB + ABC$

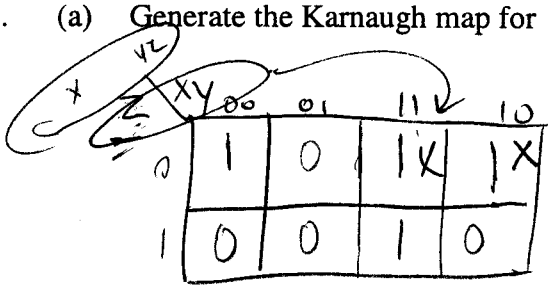
$\bar{A}\bar{B}C + AB(1+C)$

$\bar{A}\bar{B}C + AB$ ✓

Name: Jose Chu

pts.

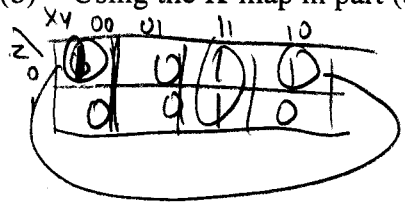
(12) 7. (a) Generate the Karnaugh map for $f(x,y,z)=\Sigma m(0,2,3,7)$.



X	Y	Z		
0	0	0	1	0
0	0	1		1
0	1	0	1	2
0	1	1	1	3
1	0	0		4
1	0	1		5
1	1	0		6
1	1	1	1	7

~~4~~ -2

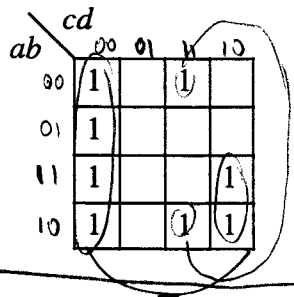
(b) Using the K-map in part (a), simplify the function *f*.



$f(x,y,z) = xy + \bar{y}\bar{z}$ X

~~4~~ -3

(9) 8. Find the simplest form of the function $g(a,b,c,d)$ which is described by the following K-map:



$g(a,b,c,d) = \bar{c}\bar{d} + \bar{b}cd + ac\bar{d}$ ✓

-1