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EE220 HW 1
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Chapter 2 Homework

1. Convert 32910 to base-2, base-3, base-8, and base-16

32910 (continually dividing by 2)
16455 R 0
8227 R 1
4113 R 1
2056 R 1
1028 R 0
514 R 0
257 R 0
128 R 1
64 R 0
32 R 0
16 R 0
8 R 0
4 R 0
2 R 0
1 R 0
0 R 1

1000 0000 1000 1110_2

32910 (continually dividing by 3)
10970 R 0
3656 R 2
1218 R 2
406 R 0
135 R 1
45 R 0
15 R 0
5 R 0
1 R 2
0 R 1

1200010220_3

32910 (continually divided by 8)
4113 R 6
514 R 1
64 R 2
8 R 0
1 R 0
0 R 1

100216_8

(converted from our binary answer)

808E_16

2. Convert 82.9210 to base-2 and base-5. Take your answer to no more than 6 places to the

right of the radix point. Truncate if necessary.
82 (continually divided by 2)
41 R 0
20 R 1
10 R 0
5 R 0
2 R 1
1 R 0
0 R 1 (now we are done with the whole portion)
0.9210 (continually divided by 2)
- 0.5 = 0.4605 R 1
- 0.25 = 0.23025 R 1
- 0.125 = 0.0460 R 1
- 0.0625 = R 0
- 0.03125 = 0.01475 R 1
- 0.015625 = R 0

1010010.111010_2

82 (continually divided by 5)
16 R 2
3 R 1
0 R 3
0.9210 (decimal)
- 0.8 = 0.1210 R 4
-0.12 = 0.0010 R 3
-0.0096 = 0.0004 R 0 0 3
R 0

312.430030_5

3. Convert 15.78 to base-2. Take your answer to only 2 places to the right of the radix point.
Round if necessary.
111 = 15. easy.
0.11 = 0.75. close enough

1111.11_2

4. Convert 0101 1100 1010 0101 1110_2 to hexadecimal

5CA5E_16

5. Convert DEAF.BEE_16 to binary

1101 1110 1010 1111 . 1011 1110 1110_2

6. Convert 5A6F_16 to octal

0101 1010 0110 1111_2
group it by 3
0 101 101 001 101 111

055157_8

7. Convert 566_10 to BCD.

0100_0110_0110_BCD

8. Convert 01111000_2 to BCD

120_10

0001 0010 0000_BCD

9. Convert 0011 0101 1000_BCD to decimal and binary

358_10

256,64,32,4,2

101100110_2

10. Write out the hex equivalent of message “Happy Birthday” in ASCII. Do not include the codes for the quotes around the message.

48 61 70 70 79 20 42 69 72 74 68 64 61 79

Chapter 3 Homework

1.
Draw the truth table for a 3-variable function whose output is FALSE any time an odd number of its inputs is TRUE.

A	B	C	Output
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

2.
Draw the truth table for a 4-variable function whose output is FALSE any time an even number of its inputs is TRUE.

A	B	C	D	Output
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

3.
Draw the truth table for a 4-variable function whose output is TRUE any time its inputs, when interpreted as the bits of a 4-bit unsigned binary

number, is a
multiple of 4 (consider 0 to be a multiple of 4).

ABCD	output
0000	1
0001	0
0010	0
0011	0
0100	1
0101	0
0110	0
0111	0
1000	1
1001	0
1010	0
1011	0
1100	1
1101	0
1110	0
1111	0

4. For each of the problems above, write the Boolean equation for the function by
reading it off the truth table.
(1) F = A'B'C + A'BC' + AB'C' + ABC
  (A xor B xor C)
(2) F = A'B'C'D' + A'B'C'D + A'B'CD' + A'BC'D' + A' BCD + AB'C'D' + AB'CD + ABC'D + ABCD'
(3) F = A'B'C'D' + A'BC'D' + AB'C'D' + ABC'D'

5. Prove that the following identity is TRUE using a truth table: AC + A'B + BC = AC + A'B. What's its name?
The concensus theorum

ABC	AC	A'B	BC	AC+A'B+BC	AC+A'B
000	0	0	0	0	0
001	0	0	0	0	0
010	0	1	0	1	1
011	0	1	1	1	1
100	0	0	0	0	0
101	1	0	0	1	1
110	0	0	0	0	0
111	1	0	1	1	1

6. Prove the following is TRUE by multiplying it out and simplifying
(A+BC)(A+DE) = A + BCDE
(A+A)(A+DE)(A+BC)(BC+DE)
(A+DE)(A+BC)(BC+DE)
(A+(DE)(BC))(BC+DE)
A+BCDE = A+BCDE

7. Write the dual for equality in the previous problem

(A'(B'+C'))+(A'(D'+E')) = A'(B'+C'+D'+E')