Kingdom of Saudi Arabia Ministry of Education Shaqra University CCIT		٢١١ عال – تصميم المنطق الرقمي CSC 211 - Digital Logic Design First Term 1439/1440

Solution to Midterm #1

General Information

- Date: Wednesday, October 24th, 2018
- Duration: 60 minutes
- Total marks: 20

Instructions and Guidelines

- No books or notes are permitted.
- Computer usage is prohibited.
- Cell phones must be turned off.
- Calculators are not allowed.
- Try to answer all questions.
- Write down your answers neatly in this booklet.
- To earn partial marks, justify your answers.
- If you need extra paper, request some from a proctor.

Grading

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
Points	$\overline{2}$	$\overline{2}$	$\overline{1}$	$\overline{2}$	$\overline{2}$	$\overline{2}$	$\overline{2}$	$\overline{3}$	$\overline{3}$	$\overline{1}$	$\overline{20}$

Student Name: ....

ID Number: ....

Q1 [2 Points]

Convert 44.375_{10} to binary.

$44 / 2 = 22, \mathbf{0}$	$0.375 * 2 = \mathbf{0}.75$
$22 / 2 = 11, \mathbf{0}$	$0.75 * 2 = \mathbf{1}.5$
$11 / 2 = 5, \mathbf{1}$	$0.5 * 2 = \mathbf{1}.0$
$5 / 2 = 2, \mathbf{1}$	➔ 0.011_2
$2 / 2 = 1, \mathbf{0}$	
$1 / 2 = 0, \mathbf{1}$ ➔ 101100_2	
➔ 101100.011_2	

Q2 [2 Points]

Convert 725_8 to hexadecimal.

$$7 \quad 2 \quad 5_8$$
$$\downarrow \quad \downarrow \quad \downarrow$$
$$111\ 010\ 101_2 = 0001\ 1101\ 0101_2$$
$$\downarrow \quad \downarrow \quad \downarrow$$
$$1 \quad D \quad 5_{16}$$

Q3   [1 Point]

Convert 985_{10} to BCD.

9   8 5_{10}

↓   ↓   ↓

$1001\ 1000\ 0101_{BCD}$

Q4   [2 Points]

Convert the Gray code 10110010 to binary.

1 0 1 1 0 0 1 0_{GRAY}

↓↗↓↗↓↗↓↗↓↗↓↗↓↗↓

1 1 0 1 1 1 0 0_{2}

Q5 [2 Points]

Express 0.00011001_2 in the single-precision floating-point format.

$0.00011001_2 = 1.1001 * 2^{-4}$

$S = 0$, $E = -4_{10}+127_{10} = 123_{10} = 01111011$, F= 10010000000000000000000

Number ➜ 0 01111011 10010000000000000000000

Q6 [2 Points]

Convert the sign-magnitude number 1011011110 to the 1's complement form.

1011011110_{SM} represents -011011110_2

-011011110_2 can be represented in 1's complement form by:

1's complement of (0011011110) ➜ 1100100001

Q7 [2 Points]

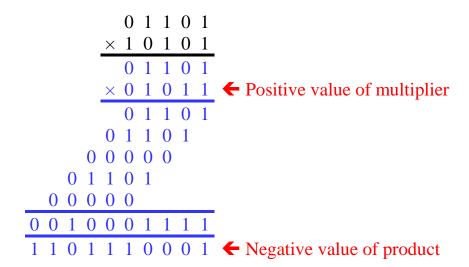Subtract the following BCD numbers:

```
    0 1 0 1 0 0 1 0
  – 0 0 1 1 1 0 0 1
  ─────────────────
    0 0 0 1 1 0 0 1   ← Borrow taken from 2nd to 1st digit!
          – 0 1 1 0   ← Correction is needed!!
          ─────────
    0 0 0 1 0 0 1 1
```

Q8 [3 Points]

Divide the following unsigned binary numbers:

```
                0 0 0 0 1 1 0 1
      1 0 1 1 │ 1 0 0 1 0 1 0 1
                1 0 1 1 ↓ ↓ ↓
                ───────
                0 1 1 1 1 ↓ ↓
                  1 0 1 1 ↓ ↓
                  ───────
                  1 0 0 0 1
                    1 0 1 1
                    ───────
                      1 1 0
```

Q9 [3 Points]

Multiply the following 2's complement numbers:

```
            0 1 1 0 1
        ×   1 0 1 0 1
            0 1 1 0 1
        ×   0 1 0 1 1   ← Positive value of multiplier
            0 1 1 0 1
          0 1 1 0 1
        0 0 0 0 0
      0 1 1 0 1
    0 0 0 0 0
  0 0 1 0 0 0 1 1 1 1
  1 1 0 1 1 1 0 0 0 1   ← Negative value of product
```

Q10 [1 Point]

Determine which of the following odd parity codes are in error (if any): (a) 10101101 and (b) 1111101011. Justify your answer to get the full marks.

Number of 1's in 10101101 is odd ➜ No error!

Number of 1's in 1111101011 is even ➜ Error!