**Quiz No. 1**

***Student name: Student ID:***

***Q1****:* (12 points)

1. Given the two binary numbers ***10010101*** and ***00110011***,
   1. Show the decimal equivalent of each of the numbers if they are interpreted as:

***(i) BCD Exsess3 (ii) BCD 8421 (iii) Signed number (iv) Unsigned number***

***Answer here***

***1001 0101 0011 0011***

1. ***BCD Exsess3 6 2 0 0***
2. ***BCD 8421 9 5 3 3***
3. ***Signed number - 21 51***

***(iv) Unsigned number 149 51***

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1. The following decimal numbers are to be stored in 8-bit two’s complement format, show how they are stored. ***(i) + 92 (ii) - 50 (iii) + 124***

***Answer here***

1. ***+ 92 🡪 01011100***
2. ***- 50 🡪 -(00110010)🡪 11001110***
3. ***+ 124🡪 01111100***

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1. Show the Truth Table and the function for a system that has four inputs, *a, b, c* and *d*, and one output, *f .* The first two inputs (*a, b*) represent one binary number in the range 0 to 2, (3 is not used) and the last two (*c, d*) represent another number in the same range. The output, *f* is ***1*** if and only if the two numbers do not differ by more than one (i.e., |ab – cd| <= 1).

Sol: F= ∑m(0,1,4,5,6,9,10)

|  |  |
| --- | --- |
| **ab cd** | **f** |
| 00 00 | 1 |
| 00 01 | 1 |
| 00 10 | 0 |
| 01 00 | 1 |
| 01 01 | 1 |
| 01 10 | 1 |
| 10 00 | 0 |
| 10 01 | 1 |
| 10 10 | 1 |

***Q2:*** (8 points)

Given the following function, assume all variables are available both uncomplemented and complemented.

***F(w, x, y, z) = w’xy’ + w’z + x’z’***

1. Show a block diagram for two level implementation of *F* using ***AND*** and ***OR*** gates.
2. Show a block diagram for an implementation of *F* using ***only two-input NAND gates***.

Answer here

(a)

X

Y

Z

W’

z

X’

Z’

F

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(b)

***F(w, x, y, z) = w’xy’ + w’z + x’z’ = w’(xy’+z) + x’z’***

x

F

y’

z’

w’

X’

Z’

***Q3:*** *(10 points)*

Find a minimize sum of product expression for each of the following functions. Show each Algebraic step and show the k-maps corresponding to those steps.

1. ***F(w,x,y,z) = x’z’+ xy’z+ x’yz’+ xyz+wx’z***
2. ***G(a,b,c,d) = ∑m(4, 5, 7, 11, 12, 13, 14, 15)***

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Answer here

1. ***F(w,x,y,z) = x’z’ + xy’z+ x’yz’+ xyz+ wx’z = x’z’(1+ y) +xz(y+y’) + x’(z’+wz)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Wx  yz | 00 | 01 | 11 | 10 |
| 00 | 1 |  |  | 1 |
| 01 |  | 1 | 1 | 1 |
| 11 |  | 1 | 1 | 1 |
| 10 | 1  1 |  |  | 1  1 |

***F = x’z’ +xz + x’(z’+wz)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Wx  yz | 00 | 01 | 11 | 10 |
| 00 | 1 |  |  | 1 |
| 01 |  | 1 | 1 | 1 |
| 11 |  | 1 | 1 | 1 |
| 10 | 1 |  |  | 1 |

***F = x’z’ +xz + x’(z’+wz)= x’z’ +xz + x’z’+wx’ = wx’+ xz + x’z’***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Wx  yz | 00 | 01 | 11 | 10 |
| 00 | 1 |  |  | 1 |
| 01 |  | 1 | 1 | 1 |
| 11 |  | 1 | 1 | 1 |
| 10 | 1 |  |  | 1 |

1. ***G(a,b,c,d) = ∑m(4, 5, 7, 11, 12, 13, 14, 15)***

***= bc’ + bd +ab +acd***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ab  cd | 00 | 01 | 11 | 10 |
| 00 |  | 1 | 1 |  |
| 01 |  | 1 | 1 |  |
| 11 |  | 1 | 1 | 1 |
| 10 |  |  | 1 |  |