



## EE1005 – Digital Logic Design Quiz# 3

**Instructor:** Muhammad Adeel Tahir

**Section:** CS-2F

**Time:** 20 Minutes

**Name:** \_\_\_\_\_

**Roll No:** \_\_\_\_\_

**Total: 10 marks**

**Note:** Use the back side of the page if needed. Make sure the handwriting is neat and clean while drawing the circuit, quiz will be marked as 0 if attempted in a writing that is not readable at all.

**Question:** Design a circuit with a 4-bit BCD input A, B, C, D that produces an output W, X, Y, Z that is equal to the input + 3 in binary. For example, 9 (1001) + 3 (0011) = 12 (1100). The outputs for invalid BCD codes are don't-cares.

**(10 marks)**

**Let A,B,C,D represent the 4-bit BCD Input and W,X,Y,Z as the output.**

**Create a Truth Table such that the output is equal to input +3 in binary.**

BCD Input				Output			
A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0
1	0	1	0	X	X	X	X
1	0	1	1	X	X	X	X
1	1	0	0	X	X	X	X
1	1	0	1	X	X	X	X
1	1	1	0	X	X	X	X
1	1	1	1	X	X	X	X

**Find the Boolean Expression for each Output W,X,Y,Z using Karnaugh Map.**

**K-Map for W:**

		CD			
		00	01	11	10
AB	00	0	0	0	0
	01	0	1	1	1
	11	X	X	X	X
	10	1	1	X	X

Boolean expression derived from the K-Map for W:

$$W = A + BD + BC$$

**K-Map for X:**

		CD			
		00	01	11	10
AB	00	0	1	1	1
	01	1	0	0	0
	11	X	X	X	X
	10	0	1	X	X

Boolean expression derived from the K-Map for X:

$$X = B'D + B'C + BC'D'$$

**K-Map for Y:**

		CD			
		00	01	11	10
AB	00	1	0	1	0
	01	1	0	1	0
	11	X	X	X	X
	10	1	0	X	X

Boolean expression derived from the K-Map for Y:

$$Y = C'D' + CD$$

**K-Map for Z:**

		CD			
		00	01	11	10
AB	00	1	0	0	1
	01	1	0	0	1
	11	X	X	X	X
	10	1	0	X	X

Boolean expression derived from the K-Map

$$Z = D'$$

Here's the Logic Circuit with a 4-Bit BCS Input that produces a 4 Bit that is equal to input+3.



