

Taibah University College of Computers science and Engineering		Date: Tue 9 Oct. 2022 Time: 9:00 — 10:00
تصميم المنطق الرقمي COE 211 YCSB3 – Midterm		Total Marks: 30

1. Convert the signed decimal number -14 to binary equivalent $\begin{array}{r} -16 \quad 8 \quad 4 \quad 2 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 1 \quad 0 \end{array}$	2. What is the largest signed decimal number that can be expressed with 4-bits? What is the equivalent hexadecimal numbers? $\begin{array}{r} -8 \quad 4 \quad 2 \quad 1 \\ \hline 1 \quad 1 \quad 1 \quad 1 \end{array} \Rightarrow 7$ $-8 \in 1 \quad 0 \quad 0 \quad 0$
--	--

Add the following numbers **without converting** them to decimal.

3. A001H + 3FFF $\begin{array}{r} A001 \\ 3FFF \\ \hline E000H \end{array}$	4. 1101 + 0111 (Binary) $\begin{array}{r} 1101 \\ 0111 \\ \hline 10100 \end{array}$
--	--

Obtain the r-1's complement of the following numbers (Note that **r: Radix**)

5. 00010000 (Binary) 11101111	6. A25FH 5DA0H
---	--

7. Represent decimal number 31 in unsigned binary form $\begin{array}{r} 16 \quad 8 \quad 4 \quad 2 \quad 1 \\ \hline 1 \quad 1 \quad 1 \quad 1 \quad 1 \end{array}$	8. Represent decimal number -53 in 8-bit signed binary form $\begin{array}{r} 11001011 \\ \hline 111001011 \end{array}$
--	---

9. Represent decimal number 10 in BCD 0001 0000	10. Represent decimal number 52 in Gray code 0111 0011
--	---

11. Simplify For the Boolean equation

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

$$\begin{aligned} F &= A(B + \bar{B}) + \bar{A}B + (\bar{A} + \bar{B}) \\ &= A + \bar{A}B + \bar{A} + \bar{B} \\ &= 1 + \bar{A}B + \bar{B} \\ &= 1 \end{aligned}$$

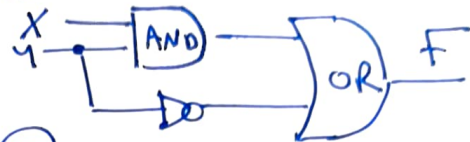
12. For the Boolean equation $F = \bar{Y} + XY$

- Construct the Truth table
- Sketch the Logic diagram
- Simplify the Equation

a)

x	y	xy	$\bar{y}$	F
0	0	0	1	1
0	1	0	0	0
1	0	0	1	1
1	1	1	0	1

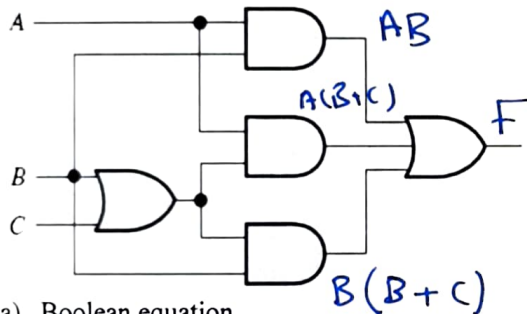
b)



c)

$$\begin{aligned} F &= \bar{Y} + XY = (\bar{Y} + X)(\bar{Y} + Y) \\ &= \bar{Y} + X \end{aligned}$$

13. For the logic diagram shown below, obtain



- Boolean equation
- Construct the truth table

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

$$\begin{aligned} F &= AB + A(B+C) + B(B+C) \\ &= AB + AC + B + BC \\ &= B(A + 1 + C) + AC \\ &= B + AC \end{aligned}$$

Mostafa A. Elhosseini

Taibah University Professor
<https://youtube.com/drmelhosseini>