DIGITAL LOGIC & DESIGN (EE-1005)
ASSIGNMENT #2

ID: _____

NAME: _____

SECTION: ____

Read the Instructions Carefully

- ***NOTE:** Use Assigned number & Your Name*
- *(Same as Assignment 1)*
  - Your assigned number is given to you in excel sheet provided with assignment
  - **FOR EXAMPLE:** Assigned Number if your assigned number is **0821**

	Assign Digit 0	Assign Digit 1	Assign Digit 2	Assign Digit 3
Short for Assigned Digit	**A0**	**A1**	**A2**	**A3**
Write Assigned Number Digit By Digit	7	8	2	1

FOR EXAMPLE: Name is **HAMAZADAUD**

- *Use your name instead of HAMZA*
- *If your name starts with **MUHAMMAD** kindly use your second name*
- *Convert repeated character to small letter or to other symbols to make them unique (see example for **A, a & @**)*

	SIXTH CHARACTER OF YOUR NAME	FIFTH CHARACTER OF YOUR NAME	FOURTH CHARACTER OF YOUR NAME	THIRD CHARACTER OF YOUR NAME	SECOND CHARACTER OF YOUR NAME	FIRST CHARACTER OF YOUR NAME	ZERO CHARACTER OF YOUR NAME
Short for CHARACTER	**C0**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
YOUR NAME CHARACTER BY CHARACTER	$	@	a	Z	M	A	H

ID:_____ ASSIGNMENT # 2 [EE-1005] Assigned Number:_____

1. Simplify the following using Boolean algebra

Replace Z with C0 of your name, Y with C1, X with C2 and W with C3 then simplify

1. $\overline{(W+\overline{X}(Y+\overline{Z}))}\cdot\overline{(WX+YZ)}+(W+\overline{X})(X+Z)$
2. $\overline{W+(X\cdot\overline{Y})(Z+\overline{X})}\cdot(W\cdot\overline{X}+\overline{Y}Z)+(\overline{W}+XY)Z$
3. $(W+\overline{X})(\overline{W+Y}+\overline{Z})\cdot\overline{(X+Y)}+W\cdot\overline{X+YZ}$
4. $\overline{(\overline{W}+\overline{X})(Y+Z)}+(W+X)(\overline{W\cdot X}+\overline{Y}Z)$
5. $\overline{W+(X+Y)(\overline{W\cdot Z})}+W\cdot\overline{X+YZ}+\overline{W+X}\cdot(Y+Z)$

2. Perform the following on Canonical sum
   - Create truth table from the following Canonical sum
   - Extract Standard SOP
   - Simplify SOP using Boolean algebra
   - Check your answer by mapping canonical sum to K-map
   - Extract Prime Implicants and Essential Prime Implicants

NOTE: To get (A2+A3) ADD last two digit of the assigned number if the sum is greater than seven force it equal result to 7

$$F(x,y,z)=\sum(0,\boldsymbol{A2},\boldsymbol{A3},(\boldsymbol{A2}+\boldsymbol{A3}),6)$$

3. Create truth table from the following Canonical product and extract Standard POS. Simplify POS using Boolean algebra and check your answer by mapping canonical product to K-map.

NOTE: To get (A2+A2) ADD last two digit of the assigned number if the sum is greater than seven force it equal result to 6

$$F(l,m,n)=\prod(1{,}2\,,\boldsymbol{A2},\boldsymbol{A3},(\boldsymbol{A2}+\boldsymbol{A3}),5)$$

4. Standardize following expression to Standard SOP by using Boolean algebra and convert to canonical sum to Canonical product and generate POS that has character of your name as variables given below

NOTE: Change domain variables Replace B with C2, A with C3, C with C4 and D with C5 then simplify

$$A\overline{B}C+\overline{A}\overline{B}+AB\overline{C}D$$

5. Standardize following expression to Standard POS by using Boolean algebra and convert to canonical product to Canonical sum and generate SOP that has character of your name as variables given below

NOTE: Change domain variables Replace A with C1, B with C2, C with C3 and D with C4 then simplify

$$(A + \overline{B})\,(B + C)$$

6. Plot the canonical product to K-map, extract simplified SOP expression, Identify Prime and Essential prime implicants and implement circuit using just NAND gate

NOTE: If any Sum is greater than 15 considered sum equal 15

$$F(e,f,g,h) = \prod(0, \boldsymbol{A0}, \boldsymbol{A1}, \boldsymbol{A2}, \boldsymbol{A3}, (\boldsymbol{A0} + \boldsymbol{A3}), (\boldsymbol{A1} + \boldsymbol{A2}), (\boldsymbol{A2} + \boldsymbol{A3}), 12{,}14)$$

7. Plot the canonical sum to K-map, extract simplified POS expression and implement circuit using just NOR gate

NOTE: If any Sum is greater than 15 considered sum equal 10

$$F(i,j,k,l) = \sum(2, \boldsymbol{A0}, \boldsymbol{A1}, \boldsymbol{A2}, \boldsymbol{A3}, (\boldsymbol{A0} + \boldsymbol{A2}), (\boldsymbol{A1} + \boldsymbol{A3}), (\boldsymbol{A2} + \boldsymbol{A3}), 12{,}14)$$

8. Plot the canonical sum to K-map, extract simplified SOP expression, Identify Prime and Essential prime implicants and implement circuit using just NAND gate

NOTE: If any Sum is greater than 31 considered sum equal 31

$$F(a,b,c,d,e) = \sum(3, \boldsymbol{A0}, \boldsymbol{A1}, \boldsymbol{A2}, \boldsymbol{A3}, (\boldsymbol{A0} + \boldsymbol{A2}), (\boldsymbol{A0} + \boldsymbol{A1}), (\boldsymbol{A0} + \boldsymbol{A2} + \boldsymbol{A3}), (\boldsymbol{A1} + \boldsymbol{A2} + \boldsymbol{A3}), 17{,}23{,}27{,}30)$$

9. Plot the canonical sum to K-map, extract simplified POS expression and implement circuit using just NOR gate

NOTE: If any Sum is greater than 31 considered sum equal 31)

$$F(p,q,r,s,t) = \prod(1, \boldsymbol{A0}, \boldsymbol{A1}, \boldsymbol{A2}, \boldsymbol{A3}, (\boldsymbol{A0} + \boldsymbol{A2}), (\boldsymbol{A1} + \boldsymbol{A3}), (\boldsymbol{A0} + \boldsymbol{A1} + \boldsymbol{A2}), (\boldsymbol{A0} + \boldsymbol{A2} + \boldsymbol{A3}), 16{,}19{,}27{,}26{,}29)$$

10. Plot the canonical sum and don't care conditions to K-map, extract simplified SOP expression, Identify Prime and Essential prime implicants and implement circuit using just NAND gate

NOTE: If any Sum is greater than 15 considered sum equal 15 if any minterm is equal to don't care give priority to don't care condition

$$F(w,x,y,z) = \sum(0, \boldsymbol{A0}, \boldsymbol{A1}, (\boldsymbol{A0}+\boldsymbol{A3}), (\boldsymbol{A1}+\boldsymbol{A2}), (\boldsymbol{A2}+\boldsymbol{A3}), 12,14)$$

$$D(w,x,y,z) = \sum(\boldsymbol{A2}, \boldsymbol{A3}, 12,13)$$

11. Plot the canonical product and don't care conditions to K-map, extract simplified POS expression and implement circuit using just NOR gate

NOTE: If any Sum is greater than 15 considered sum equal 15 if any maxterm is equal to don't care give priority to don't care condition

$$F(w,x,y,z) = \prod(1, \boldsymbol{A2}, \boldsymbol{A3}, (\boldsymbol{A0}+\boldsymbol{A3}), (\boldsymbol{A1}+\boldsymbol{A2}), 12,14)$$

$$D(w,x,y,z) = \sum(\boldsymbol{A0}, \boldsymbol{A1}, 9,10,11)$$