(EL-227) Digital Logic Design Lab

Spring 2021

FAST-NU Peshawar Campus

Assignment # 01

- The due date for this homework is **April 13th, 2021**
- There is **25%** penalty for late submission.
- Copied assignments will be awarded zero marks.
- All submissions should be made on Google Class Room.
- Upload only a PDF/MS word file including all tasks.
- Note that these assignment marks could be graded through a quiz (viva) in class.
- Use Logic.ly to design circuit diagrams.

1. F1 = AB+A'BC'+A'BC+AB'C'

2. F2 = A'B'C'D+AB'C'D+A'BC'D+ABC'D+A'BCD+ABCD

3. F3 = C + S where C = xy + yz and S = C' (x+y) + xyz

   Your Task is :
   1. Design Truth tables for all the above Boolean Functions.
   2. Design Circuit Diagrams for all the Boolean Functions using basic gates (OR, AND, NOT). *List down how much IC's will be used (with their name & number) in circuit diagram.*
   3. Design Circuit Diagrams for all the Boolean Functions using Universal Gate (NOR).

4. A truth table was given for a function F in Table 1. Give three representations of this function: one in terms of maxterm list, one symbolically using a product of appropriate M_i, and the last by multiplying the actual maxterms.
   i.e $F = \pi(0,3,5) = (M_0 M_3 M_7) = (x+y+z).(x+y'+z).(x'+y'+z)$.

Table 1. Truth Table

S.No	X	Y	Z	F (output)
0	0	0	0	0
1	0	0	1	1
2	0	1	0	0
3	0	1	1	0
4	1	0	0	0
5	1	0	1	1
6	1	1	0	0
7	1	1	1	1

5. Using K-maps, find the minimal Boolean expression of the following SOP and POS representations and draw a gate circuit equivalent to simplified expression.

  I. $F(P,Q,R,S) = \sum(2,4,6,9,10,11,12,13,15)$
  II. $F(A,B,C,D) = \sum(7,9,12,13,14,15)$
  III. $F(W,X,Y,Z) = \pi(0,2,3,4,8,9,10,14)$
  IV. $F(W,X,Y,Z) = \pi(4,5,6,7,10,12,13,15)$

6. Use a Karnaugh map to generate a simple Boolean expression for the truth table given in table 2, and draw a gate circuit equivalent to that expression:

Table 2 Truth Table

S.No	A	B	C	D	F (output)
0	0	0	0	0	0
1	0	0	0	1	1
2	0	0	1	0	0
3	0	0	1	1	0
4	0	1	0	0	0
5	0	1	0	1	1
6	0	1	1	0	0
7	0	1	1	1	0
8	1	0	0	0	0
9	1	0	0	1	1
10	1	0	1	0	1
11	1	0	1	1	1
12	1	1	0	0	0
13	1	1	0	1	1
14	1	1	1	0	0
15	1	1	1	1	1