Tutorial – 2 (UEC-612)

Q-1: Simplify the Boolean functions using Boolean Algebra:-

(i) x'y'z + x'yz + xy' = x'z + xy'
(ii) x'y + xz = (x+y+z).(x+y'+z).(x'+y+z).(x'+y+z')
(iii) xy + x'z + yz = xy +x'z
(iv) A'B'C + AB'C' + AB'C + ABC' + ABC = A + B'C

Q-2: Simplify the following Boolean functions and implement them (a) with basic logic gates (b) and with universal gates.

(i) F = AB' + ABD + ABD' +A'C'D' + A'BC'
(ii) F = BD +BCD' + AB'C'D

Q-3: Write the expanded forms of following Boolean expressions:

(i) F (A, B, C) = B + AB' + ABC' + BC
(ii) F = (A+B) .(A+C+D) (B+C+D)

Q-4: Express the canonical and minimal forms of following Boolean functions:-

(a) F(A, B, C) = $\prod$ M (0, 3, 7)
(b) F (A, B, C) = $\sum$ m (0,2,4, 5, 6)

Q-5: Determine the minimum Sum-of-Products form of the Boolean function F(A,B,C,D) = $\sum$ m (3,5,7,8,10,11,12,13) using K-Map and implement it with NAND gates.

Q-6: What is the maxterm equivalent of the following Boolean function, minimize it using K-Map to express the POS function and implement using NOR gates:-

f (w, x, y, z) = $\sum$ m (0, 1, 7, 8, 9)

Q-7: Simplify the Boolean function using K-Map:

(i) f (a, b, c,d) = $\sum$ (2,4,6,10,12) with don't care function defined as = $\sum$ (0,8,9,13)
(ii) F = $\prod$ (2, 8, 9, 10, 11, 12, 14)

Q-9: Simplify the Boolean function using K-Map and express the minimized expressions in SOP and POS forms:

(i) f (a, b, c,d) = $\sum$ (4,5,6,7,15)
(ii) f (a, b, c,d) = $\sum$ (0,1,5,7, 8,9)
(iii) f (x,y,z) = yz + x'z' and don't care function d (x, y, z) = xy' + xyz'+x'y'z

Q-11: Express the normal and complemented forms of the following Boolean functions in minimal forms:-

(a) F(w, x, y, z) = $\sum$ (0, 1,2, 4, 5, 6, 8, 9, 12, 13, 14)
(b) F (x, y, z) = $\prod$ M (0, 3, 6, 7)

Q-12: For the following truth table of a function, do the following:

(i) List the minterms that form the function.
(ii) Express the function in canonical form and find its minimal form using Boolean algebra .
(iii) Find the minimal and complemented forms of the function using K-Map technique.

x	**y**	**z**	**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

Q-13: A 3-bit binary number (xyz) is converted to another three bit binary number (ABC) as per functional relationship given below. Develop the truth table of the functional relationship between input and output, work out the expressions for each bit of output number and realize them using general purpose gates:-

(a) When input 'xyz' is 0, 1, 2, or 3, the binary output ABC is one greater than the input.

(b)When input 'xyz' is 4, 5, 6, or 7, the binary output ABC is two less than the input.