Digital Circuits and Systems
NOC, Spring 2015
Quiz 1 Solutions

For questions, refer to the Quiz page. Only the solutions are given below.

Q1: In boolean algebra 1+1=1, so x+y = 1.
Answer: a

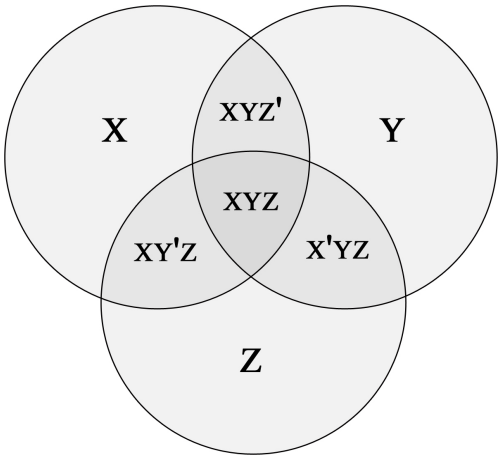
Q2: F1(x,y,z) = x + yz
F2(x,y,z) = x + xy + yz = x(1+y) + yz = x + yz
F3(x,y,z) = (x+y) (x+z) = x.x + x.z + x.y + y.z = x (1+z+y) + yz = x + yz

All the three functions evaluate to the same function. Thus F1, F2 and F3 are all equivalent.
Answer: d

Q3: (x+y)(x+y') = x.x+x.y'+y.x+y.y'
= x+xy'+xy
= x(1+y'+y)
= x

Answer: a

Q4:



Boolean Expression for shaded region is XYZ' + XY'Z +X'YZ.
Answer: b

Q5:

X	Y	Z	(Y+Z)	(X+Y)	(X+Z)	X . (Y+Z)	(X+Y) . (X+Z)
1	0	0	0	1	1	0	1
0	1	0	1	1	0	0	0
1	1	0	1	1	1	1	1
0	1	1	1	1	1	0	1

Answer : b & c

Q6: AB + AB' +A'C
A(B + B') + A'C
A + A'C
(A + A') . (A + C)
(A + C)

Answer: d

Q7: X * Y = X' + Y M = X * Y
M * X = (X' + Y) * X
= (X' + Y)' + X
= ((X')' . Y') + X
= (X.Y') + X
= X (Y' + 1)
= X

Answer :b

Q8: If 123 in base 10 is 1A11B11 in base 2, which of the following is correct?

1x64+Ax32+1x16+1x8+Bx4+1x2+1x1 = Ax32+Bx4+91 = 123

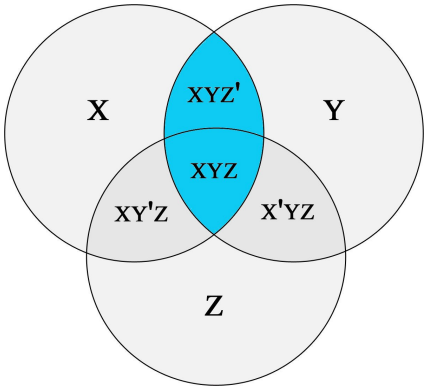
Ax32+Bx4 = 123 - 91 = 32

=> A = 1, B = 0 (A, B can have values 0 or 1 only)

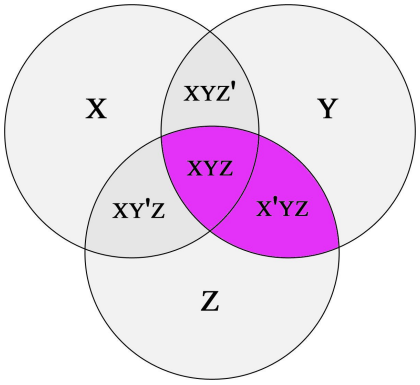
Answer :c

Q9: If x, y and z are three Boolean variables, then F(x,y,z) = xy + yz + x'z is equivalent to

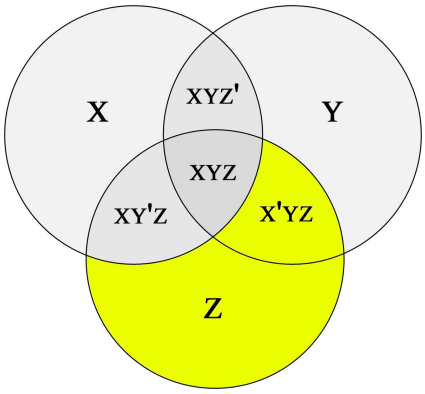
xy



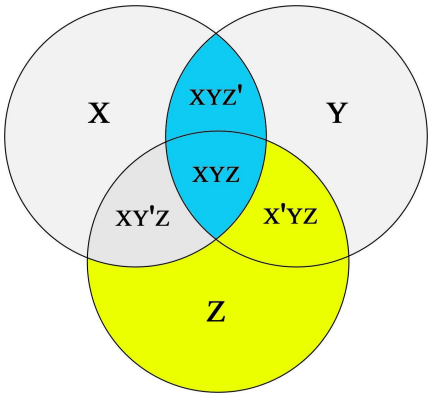
yz



x'z



xy+yz+x'z = xy + x'z



Answer : c

10. If x, y and z are three Boolean variables, then F(x,y,z) = x + xy + y + yz + z + xz is equivalent to

F(x,y,z) = x + xy + y + yz + z + xz

= x (1 + y) + y (1 + z) + z (1 + x)

= x + y + z

Answer : b

11. If x, y and z are three Boolean variables, then F(x,y,z) = xxxyx' + yyxx'x' + xy + x + x' + xyz is equivalent to

F(x,y,z) = xxxyx' + yyxx'x' + xy + (x + x') + xyz = xxxyx' + yyxx'x' + xy + (1) + xyz = 1

x + x’ = 1
1 + x = 1

Answer : b

12. If x.y = 0, at least one of x,y is 0. Similarly, if x+y=1, at least one of them is 1. This means either x=0, y=1 or y=0, x=1. The function xy’+yx’ is 2-input XOR which will give 1 as the output if x and y are different. Hence the answer is 1.

Answer : c

13. If x, y and z are three Boolean variables, then Π M(0,1,2,3,4,5,6) = Σ m(7) = xyz

1. Write the minterm shorthand notation
2. Write the maxterm notation using maxterms whose indices are not used in the minterm list

Answer : d

14.

If x, y, and z are three Boolean variables and Σ m(2,3,5,7) is equivalent to Π M(0,1,4,6)

1. Write the minterm shorthand notation
2. Write the maxterm notation using maxterms whose indices are not used in the minterm list

Note that Π m(0,1,4,6) is wrong because m (lower case) is for product terms and not sum terms.

Answer : a