Logic Design - Fall 2022-2023 – Question Bank

Lecture 1 Number Systems Questions

Q1\ Convert the following binary integer numbers to decimal:

(a) 10000001 (b) 1011001 (c) 11001000 (d) 1111111111

Q2\ Convert each decimal integer number to binary

(a) 467 (b) 341 (c) 645 (d) 2047

Q3\ Determine the 1's complement of each binary number based on 8-bit:

(a) 11000 (b) 1011011 (c) 1001010 (d) 101010

Q4\ Determine the 2's complement of each binary number based on 8-bit:

(a) 101011 (b) 111001 (c) 11001100 (d) 110111

Q5\ Express each decimal number as an 8-bit number in the signed 2's complement method:

(a) +27 (b) -28 (c) +103 (d) -121

Q6\ Determine the decimal value of each signed 8-bit binary number in the 2's complement form:

(a) 10111001 (b) 01111100 (c) 10110111 (d) 10101111

Q7\ Convert each hexadecimal number to binary:

(a) 66_{16} (b) $D4_{16}$ (c) $A5C_{16}$ (d) BCD_{16}

Q8\ Convert each binary number to hexadecimal:

(a) 111111 (b) 1010101010 (c) 101011100 (d) 101111011

Q9\ Convert each octal number into binary:

(a) 65_8 (b) 37_8 (c) 576_8 (d) 340_8

Q10\ Convert each binary number to octal:

(a) 10000 (b) 110000 (c) 1001001 (d) 10100010

Q11\ Convert each of the following decimal numbers to BCD:

(a) 79 (b) 35 (c) 57 (d) 135

Q12\ Convert each of the BCD numbers to decimal:

(a) 10001 (b) 001100010 (c) 010000101 (d) 1000011000

Lecture 2 Logic Gates and Boolean Algebra Questions

Q1\ Draw the Symbol, Boolean expression and Truth Table for each gate below (consider two inputs):

a. NOT gate
b. AND gate
c. OR gate
d. Define the following terms: Truth table, Timing diagram, and Boolean algebra

Q2\ Draw the Symbol, Boolean expression and Truth Table for each gate below (consider two inputs):

a. NAND gate
b. NOR gate
c. XOR gate
d. XNOR gate

Q3\ Find the truth table for the output for all possible values of the input variables.

(a) $A + \overline{B} + \overline{C}$ **(b)** $\overline{A} + \overline{B} + \overline{C}$ **(c)** $\overline{A}\,\overline{B}C$ **(d)** $\overline{A} + \overline{B} + C$

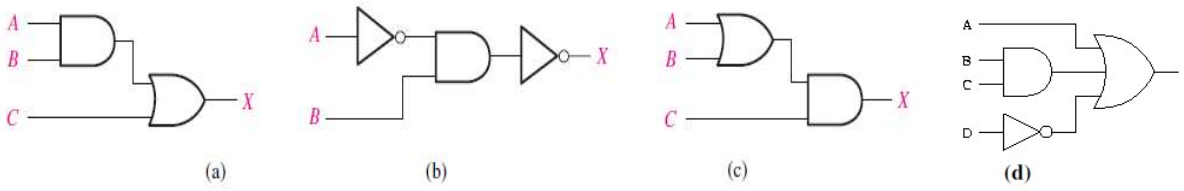
Q4\ Apply DeMorgan's Laws to each expression:

(a) $\overline{A + \overline{B}}$ **(b)** $\overline{\overline{A}B}$ **(c)** $\overline{A + B + C}$ **(d)** $\overline{ABC}$

Q5\ Apply DeMorgan's laws to each expression:

(a) $\overline{A(B + C)}$ **(b)** $\overline{AB} + \overline{CD}$ **(c)** $\overline{AB + CD}$ **(d)** $\overline{(A + \overline{B})(\overline{C} + D)}$

Q6\ Write the Boolean expression for each of the logic circuits



Q7\ Draw the logic circuit represented by each expression:

(a) $AB + \overline{AB}$ **(b)** $ABCD$
(c) $A + BC$ **(d)** $ABC + D$

Lecture 3

Q1\ Convert the following expressions to Standard sum-of-product (SOP) forms, and then from Standard SOP find out Truth Table.

(a)	$Y = BCD + D\,(B\overline{C} + B)$
(b)	$Y = B(\overline{C}\,\overline{D} + CD)$
(c)	$Y = B + CBD + C\overline{D}$
(d)	$Y = B(\overline{C}D + CD + \overline{D})$

Q2\ Develop a truth table for each of the following standard SOP expressions, then evaluate standard POS for each.

(a)	$Y = A\overline{B}C + AB\overline{C} + \overline{A}\,\overline{B}C + ABC$
(b)	$F = XYZ + X\overline{Y}Z + \overline{X}Y\overline{Z} + \overline{X}YZ + X\overline{Y}\,\overline{Z}$
(c)	$Y = \overline{A}\,\overline{B}C + AB\overline{C} + \overline{A}\,\overline{B}C + A\overline{B}C$
(d)	$F = W\overline{X}\,\overline{Y} + \overline{W}X\overline{Y} + W\overline{X}Y + \overline{W}\,\overline{X}Y + \overline{W}X\overline{Y}$

Q3\ From truth tables below, evaluate standard SOP and standard POS and from Karnaugh map then find minimum SOP and minimum POS.

a)

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

b)

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

c)

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

d)

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Q4\ For each of the following SOP expressions find minimum **POS** expressions using Karnaugh map: (Hint: Convert to standard SOP first then Truth Table then Karnaugh map then minimum POS).

(a)	$Y = A\,\overline{B}\,\overline{D} + \overline{A}B\overline{D} + \overline{A}\,\overline{B}D + \overline{A}\,\overline{B}\,\overline{D} + ABD$
(b)	$F = \overline{W}XZ + \overline{W}XZ + W\overline{X}\overline{Z} + \overline{W}\,\overline{X}Z + \overline{W}X\,\overline{Z}$
(c)	$Y = \overline{A}\,C\overline{D} + A\overline{C}\,\overline{D} + \overline{A}\,CD + AC\overline{D} + \overline{A}\,C\overline{D}$
(d)	$F = W\,\overline{X}\,Y + \overline{W}X\overline{Y} + W\overline{X}Y + \overline{W}\,\overline{X}Y + \overline{W}X\overline{Y} + WXY$