

# Logic Design – Tutorial

## 02

#	Student ID	Student Name	Grade (10)
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Q1	<p>Add and multiply the following numbers without converting them to decimal.</p> <p>(a) Binary numbers 1011 and 101.</p> <p>(b) Hexadecimal numbers 2E and 34.</p>
Sol 1	<p>(a) 10000 and 110111</p> $\begin{array}{r} 1011 \\ +101 \\ \hline 10000 = 16_{10} \end{array}$ $\begin{array}{r} 1011 \\ \times 101 \\ \hline 1011 \\ 1011 \\ \hline 110111 = 55_{10} \end{array}$ <p>(b) 62<sub>h</sub> and 958<sub>h</sub></p> $\begin{array}{r} 2E_h \quad 0010\_1110 \\ +34_h \quad 0011\_0100 \\ \hline 62_h \quad 0110\_0010 = 98_{10} \end{array}$ $\begin{array}{r} 2E_h \\ \times 34_h \\ \hline B^38 \\ 8^2A \\ \hline 9\ 5\ 8_h = 2392_{10} \end{array}$

Q2	<p>Obtain the 1's and 2's complements of the following binary numbers:</p> <p>(a) 10000000</p> <p>(c) 11011010</p> <p>(e) 10000101</p> <p>Obtain the 1's and 2's complements of the following binary numbers:</p> <p>(b) 00000000</p> <p>(d) 01110110</p> <p>(f) 11111111.</p>
Sol 2	<p>(a)</p> $\begin{array}{r} 1000\_0000 \\ 1s\ comp: 0111\_1111 \\ 2s\ comp: 1000\_0000 \end{array}$

	(c)	1101_1010							
		1s comp: 0010_0101							
		2s comp: 0010_0110							
	(e)	1000_0101							
		1s comp: 0111_1010							
		2s comp: 0111_1011							
	(b)	0000_0000							
		1s comp: 1111_1111							
		2s comp: 0000_0000							
	(d)	0111_0110							
		1s comp: 1000_1001							
		2s comp: 1000_1010							
	(f)	1111_1111							
		1s comp: 0000_0000							
		2s comp: 0000_0001							

Q3	Find the 9's and the 10's complement of the following decimal numbers:			
	(c) 25,000,000		(d) 00,000,000.	
	Find the 9's and the 10's complement of the following decimal numbers:			
	(a) 52,784,630		(b) 63,325,600	
Sol 3	(c)	25,000,000	(d)	00,000,000
		9s comp: 74,999,999		9s comp: 99,999,999
		10s comp: 75,000,000		10s comp: 00,000,000



	Perform subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend. Where the result should be negative, find its 2's complement and affix a minus sign.	
	(a) 10011 - 10001	(b) 100010 - 100011
Sol 5	<p>(c)            101000</p> <p>1s comp: 1010111</p> <p>2s comp: 1011000</p> <p>          <u>001001</u></p> <p>Diff:        1100001 (negative)</p> <p>              0011111 (2s comp)</p> <p>              -011111 (diff is -31)</p>	<p>(d)            10101</p> <p>1s comp: 1101010 with sign extension</p> <p>2s comp: 1101011</p> <p>              110000</p> <p>0011011 sign bit indicates that the result is positive</p> <p>Check: 48 - 21 = 27</p>
	<p>(a)            10001</p> <p>1s comp: 01110</p> <p>2s comp: 01111</p> <p>              <u>10011</u></p> <p>Diff:        00010</p>	<p>(b)            100011</p> <p>1s comp: 1011100 with sign extension</p> <p>2s comp: 1011101</p> <p>              <u>0100010</u></p> <p>1111111 sign bit indicates that the result is negative</p> <p>0000001 2s complement</p> <p>-000001 result</p>