

Logic Design– Assignment 02

#	Student ID	Student Name	Grade (10)
-			

Delivery Date	
---------------	--

١. يتم تسليم التمرين محلولا في خلال أسبوع من تاريخ التمرين، و يتم حذف درجتين من التمرين عن كل أسبوع تأخير
٢. يتم التسليم لمعيد المقرر مباشرة
٣. تتم أجابه التمرين في نفس ورق الأسئلة

Q1

Add the following numbers in binary using 2's complement to represent negative numbers. Use a word length of 6 bits (including sign) and indicate if an overflow occurs.

(a) $21 + 11$ (b) $(-14) + (-32)$

Repeat (a), (c), (d), and (e) using 1's complement to represent negative numbers.

So
l1

...2's complement:

$$\begin{array}{r} \text{(a)} \quad 010101 \\ + 001011 \\ \hline 100000 \end{array}$$

OVERFLOW!

$$\begin{array}{r} \text{(b)} \quad 110010 \\ + 100000 \\ \hline (1) 010010 \end{array}$$

OVERFLOW!

...1's complement:

$$\begin{array}{r} \text{(a)} \quad 010101 \\ + 001011 \\ \hline 100000 \end{array}$$

OVERFLOW!

(b) not assigned
because -32 cannot
be represented
in 6 bits

Q2	Add, subtract, and multiply in binary: (b) 1101001 and 110110 (c) 110010 and 11101								
Sol 2	<div style="border: 1px solid black; padding: 10px;"> <p>(b)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} \overset{1}{1101001} \text{ (Add)} \\ \underline{110110} \\ 10011111 \end{array}$ </td> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} \overset{11}{1101001} \text{ (Sub)} \\ \underline{110110} \\ 110011 \end{array}$ </td> </tr> <tr> <td colspan="2" style="text-align: right; padding-top: 20px;"> $\begin{array}{r} 1101001 \text{ (Mult)} \\ \underline{110110} \\ 0000000 \\ 1101001 \\ 11010010 \\ \underline{1101001} \\ 1001110110 \\ \underline{0000000} \\ 1001110110 \\ \underline{1101001} \\ 10010000110 \\ \underline{1101001} \\ 1011000100110 \end{array}$ </td> </tr> </table> <hr style="border: 0.5px solid black; margin: 10px 0;"/> <p>(c)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} \overset{1}{110010} \text{ (Add)} \\ \underline{11101} \\ 1001111 \end{array}$ </td> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} \overset{111}{110010} \text{ (Sub)} \\ \underline{11101} \\ 10101 \end{array}$ </td> </tr> <tr> <td colspan="2" style="text-align: right; padding-top: 20px;"> $\begin{array}{r} 110010 \text{ (Mult)} \\ \underline{11101} \\ 110010 \\ \underline{000000} \\ 0110010 \\ \underline{110010} \\ 11111010 \\ \underline{110010} \\ 1010001010 \\ \underline{110010} \\ 10110101010 \end{array}$ </td> </tr> </table> </div>	$ \begin{array}{r} \overset{1}{1101001} \text{ (Add)} \\ \underline{110110} \\ 10011111 \end{array} $	$ \begin{array}{r} \overset{11}{1101001} \text{ (Sub)} \\ \underline{110110} \\ 110011 \end{array} $	$ \begin{array}{r} 1101001 \text{ (Mult)} \\ \underline{110110} \\ 0000000 \\ 1101001 \\ 11010010 \\ \underline{1101001} \\ 1001110110 \\ \underline{0000000} \\ 1001110110 \\ \underline{1101001} \\ 10010000110 \\ \underline{1101001} \\ 1011000100110 \end{array} $		$ \begin{array}{r} \overset{1}{110010} \text{ (Add)} \\ \underline{11101} \\ 1001111 \end{array} $	$ \begin{array}{r} \overset{111}{110010} \text{ (Sub)} \\ \underline{11101} \\ 10101 \end{array} $	$ \begin{array}{r} 110010 \text{ (Mult)} \\ \underline{11101} \\ 110010 \\ \underline{000000} \\ 0110010 \\ \underline{110010} \\ 11111010 \\ \underline{110010} \\ 1010001010 \\ \underline{110010} \\ 10110101010 \end{array} $	
$ \begin{array}{r} \overset{1}{1101001} \text{ (Add)} \\ \underline{110110} \\ 10011111 \end{array} $	$ \begin{array}{r} \overset{11}{1101001} \text{ (Sub)} \\ \underline{110110} \\ 110011 \end{array} $								
$ \begin{array}{r} 1101001 \text{ (Mult)} \\ \underline{110110} \\ 0000000 \\ 1101001 \\ 11010010 \\ \underline{1101001} \\ 1001110110 \\ \underline{0000000} \\ 1001110110 \\ \underline{1101001} \\ 10010000110 \\ \underline{1101001} \\ 1011000100110 \end{array} $									
$ \begin{array}{r} \overset{1}{110010} \text{ (Add)} \\ \underline{11101} \\ 1001111 \end{array} $	$ \begin{array}{r} \overset{111}{110010} \text{ (Sub)} \\ \underline{11101} \\ 10101 \end{array} $								
$ \begin{array}{r} 110010 \text{ (Mult)} \\ \underline{11101} \\ 110010 \\ \underline{000000} \\ 0110010 \\ \underline{110010} \\ 11111010 \\ \underline{110010} \\ 1010001010 \\ \underline{110010} \\ 10110101010 \end{array} $									

Q3

Is it possible to construct a 5-3-1-1 weighted code? A 6-4-1-1 weighted code? Justify your answers.

Sol 3

5-3-1-1 is possible, but
6-4-1-1 is not, because
there is no way to
represent 3 or 9.

Alternate
Solutions:

	5	3	1	1	
0	0	0	0	0	
1	0	0	0	1	(0010)
2	0	0	1	1	
3	0	1	0	0	
4	0	1	0	1	(0110)
5	1	0	0	0	
6	1	0	0	1	(1010)
7	1	0	1	1	
8	1	1	0	0	
9	1	1	0	1	(1110)

