

Date: 2-Feb-2021

ASSIGNMENT 21CHAPTER - 2Question #1(a)

$$\begin{array}{r}
 1001 \\
 + 1110 \\
 \hline
 10111
 \end{array}$$

(b)

$$\begin{array}{r}
 10111 \\
 + 11101 \\
 \hline
 110100
 \end{array}$$

Question #2

$$\begin{array}{r}
 a) \quad 1101 \\
 - 0101 \\
 \hline
 1000
 \end{array}$$

$$\begin{array}{r}
 b) \quad 01011 \\
 - 0101 \\
 \hline
 0110
 \end{array}$$

Question #3

$$\begin{array}{r}
 a) \quad 1110 \\
 \times 101 \\
 \hline
 1110 \\
 1110 \\
 1110 \\
 \hline
 1000110
 \end{array}$$

(6)

Given:

Dividend: 1111 → 00001111

Divisor: 0101 → 00000101

2's complement of:  
divisor: 1011 → 11111011

Let the counter be initialized as: 00000000

The divisions proceeds as:

$$\begin{array}{r}
 1111 \\
 + 0101 \\
 \hline
 10010
 \end{array}$$

$$\begin{array}{r}
 00001111 \\
 + 11111011 \\
 \hline
 00001010
 \end{array}$$

$$\text{Counter: } 00000000 + 00000001 = 00000001$$

$$\begin{array}{r}
 00001010 \\
 + 11111011 \\
 \hline
 00000101
 \end{array}$$

$$\text{Counter: } 00000001 + 00000001 = 00000010$$

$$\begin{array}{r}
 \overset{1}{0} \overset{1}{0} \overset{1}{0} \overset{1}{0} \overset{1}{0} \overset{1}{0} \overset{1}{1} \overset{1}{0} \overset{1}{1} \\
 + \underline{11111011} \\
 00000000
 \end{array}$$

Counter :  $00000010 + 00000001 = 00000011$

Hence, the answer is:  $00000011$  i.e. 3

### Question # 4

a)  $11010101$  &

b)  $01100100$

c)  $11110001$

### Question # 5

a)  $\therefore +65 : 01000001$   
 $\therefore -65 : 10111110$

b)  $+128 : \cancel{10000000}$   
 $+126 : 01111110$

c)  $\therefore +98 : 01100010$   
 $\therefore -98 : 10011101$



Question # 6

a)  $\therefore 58 : 00111010$   
 $\therefore -58 : 11000110$

b) ~~+128~~  $112 : 01110000$

c)  $\therefore +136 : 10001000$   
 $\therefore -136 : 01111000 \Rightarrow \text{Out of range}$

Question # 7

a)  $\begin{array}{l} \text{S} - \text{Mag} \\ \underline{1} \quad 0011101 \\ - \quad 16+8+1+1 = 29 \\ \Rightarrow -29 \end{array}$

b)  $\begin{array}{l} \text{Sign} \quad \text{Mag} \\ 0 \quad 1110100 \\ + \quad \del{128} 64+32+16+4 = 116 \\ \Rightarrow +116 \end{array}$

c)  $\begin{array}{l} \text{Sign} - \text{Mag} \\ 1 \quad 0111011 \\ - \quad 32+16+8+2+1 = 59 \\ \Rightarrow -59 \end{array}$

Question # 8

a)  $\begin{array}{cc} \text{S} & \text{Mag} \\ 1 & 0111001 \end{array}$   
 1's:  $101000110$

b)  $\begin{array}{cc} \text{Sign} & \text{Mag} \\ 0 & 1100100 \end{array}$   
 1's:  $01100100$

c)  $\begin{array}{cc} \text{Sign} & \text{Mag} \\ 1 & 0011000 \end{array}$   
 1's:  $101100111$

Question # 9

a)  $1 - 0111011$   
 In binary:  
 $- 00111011$   
 2's:  $11000101$

b)  $0 - 1010100$   
 2's:  $01010100$

c)  $1 - 0011000$   
 In binary:  
 $- 00011000$   
 2's:  $11101000$

Question # 10

The largest decimal number for 'n' bits is:

$$D_L: 2^n - 1$$

$\therefore$  For  $n=8$

$$D_L: 2^8 - 1 = 256 - 1 = 255$$

Question # 11

Since, the number of bits is 5; Therefore, the weight is distributed as:

	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
$a_i$	16	8	2	1	0
Binary:	1	0	0	0	0

$\Rightarrow$  1 has a weight of 16 or  $2^4$

Question # 12

a)  $\therefore +38 \rightarrow 00101110$   
 $\therefore -38 \rightarrow 11010010$

Also,  $\therefore 27 \rightarrow 00011011$   
 $\therefore -27 \rightarrow 11100101$

$$\begin{array}{rcl} \text{e. } -38 & \rightarrow & \overset{1}{1} \ 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \\ -27 & \rightarrow & + \ 1 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 1 \\ & & \underline{1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1} \end{array}$$



$$b) \therefore 39 \rightarrow 00100111$$

$$\therefore -39 \rightarrow 11011001$$

$$\Rightarrow 59 \rightarrow \overset{11}{00} \overset{11}{11} \overset{11}{10} \overset{11}{11}$$

$$-39 \rightarrow +11011001$$

$$00010100$$

$$c) \therefore 58 \rightarrow 00111010$$

$$\therefore -58 \rightarrow 11000110$$

$$-58 \rightarrow 11000110$$

$$65 \rightarrow +01000001$$

$$00000111$$

$$d) +102 \rightarrow 01100110$$

$$-102 \rightarrow 10011010$$

$$+85 \rightarrow 01010101$$

$$-85 \rightarrow 10101011$$

~~$$-102 \rightarrow 01100110$$~~

~~$$-85 \rightarrow +10101011$$~~

~~$$00000000$$~~

~~$$-102 \rightarrow 10011010$$~~

~~$$-85 \rightarrow +10101011$$~~

~~$$101000101$$~~

~~$\therefore$  Number is out of range, we will have to include an extra bit~~

~~$$\therefore \text{Ans } 101000101$$~~

e)  $+72 \rightarrow 01001000$   
 $-72 \rightarrow 10111000$

$-72 \rightarrow 10\overset{1}{1}\overset{1}{1}1000$

$29 \rightarrow +00011101$   
 $\underline{71010101}$

f)  $+49 \rightarrow 00110001$   
 $-49 \rightarrow 11001111$

~~$111 \rightarrow 01101111$~~   
 ~~$-49 \rightarrow +10010001$~~   
 ~~$\underline{000000}$~~

$111 \rightarrow 01101111$   
 $-49 \rightarrow +11001111$   
 $\underline{00111110}$