

CSE 260 ASSIGNMENT 1

NAME: ANIKA ISLAM

ID: 21101298

SECTION: 6

ASSIGNMENT 01

(1) a) $(101110010001)_2$

$$= (1 \times 2^{11}) + (0 \times 2^{10}) + (1 \times 2^9) + (1 \times 2^8) + (1 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) \\ + (1 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \\ = \underline{\underline{(2961)_{10} \text{ (Ans)}}}$$

b) $(11011.101)_2$

$$= (1 \times 2^1) + (1 \times 2^0) + (0 \times 2^{-1}) + (1 \times 2^{-2}) + (1 \times 2^{-3}) + (1 \times 2^{-4}) + (0 \times 2^{-5}) + (1 \times 2^{-6}) \\ = 2 + 0.625 \\ = \underline{\underline{(2.625)_{10} \text{ (Ans)}}}$$

(2) $(4195)_{10}$

Division	Quotient	Remainder
$4195/2$	2097	1
$2097/2$	1048	1
$1048/2$	524	0
$524/2$	262	0
$262/2$	131	0
$131/2$	65	1
$65/2$	32	1
$32/2$	16	0
$16/2$	8	0
$8/2$	4	0
$4/2$	2	0
$2/2$	1	0
$1/2$	0	1

$(4195)_{10} = \underline{\underline{(1000001100011)_2 \text{ (Ans)}}}$

$$(3) (a) (15)_8 = ?$$

$$= (14 \times 8^1) + (15 \times 8^0)$$

$$= (127)_{10} \text{ (Ans)}$$

$$(b) (2173)_8$$

$$= (2 \times 8^3) + (1 \times 8^2) + (7 \times 8^1) + (3 \times 8^0)$$

$$= (1147)_{10} \text{ (Ans)}$$

(4) $(513)_{10} = (?)_{16}$

Division	Quotient	Remainder
$513/16$	31	1
$31/8$	3	7
$3/8$	0	3
$1/8$	0	1

Division	Quotient	Remainder
$513/16$	31	1
$31/16$	1	15
$1/16$	0	1

$$(513)_{10} = (201)_{16} \text{ (Ans)}$$

$$(5) (101101101)_2 = (?)_{16}$$

$$\begin{array}{ccc} 0001 & 0110 & 1110 \\ \hline 1 & 6 & 14 \end{array}$$

$$(1614)_{16} = (16E)_{16} \text{ (Ans)}$$

Value	Count
14	0001
6	0110
14	1110
A-10, B-11	
C-12, D-13	
E-14	

$$(b) (29)_{10} = (?)_7$$

Division	Quotient	Remainder
29/7	4	1
4/7	0	4

$$(29)_{10} = (41)_7 \text{ (Ans)}$$

$$(b) (10110111)_2 = (?)_4$$

$$(10110111)_2 = (?)_{10}$$

$$(1 \times 2^7) + (0 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) = (183)_{10}$$

$$(183)_{10} = (?)_4$$

Division	Quotient	Remainder
183/4	45	3
45/4	11	1
11/4	2	3
2/4	0	2

$$(10110111)_2 = (183)_{10} = (2313)_4 \text{ (Ans)}$$

(7) Addition:

$$\begin{array}{r} 117_8 \\ + 134_8 \\ \hline 353_8 \end{array}$$

$$\begin{array}{l} 7+4=11 \times 8 \quad | \quad 11/8=1 \quad | \quad 11-8=3 \\ 1+3+1 \text{ carry } 1=5 \times 8 \\ 4+1+0 \text{ carry } 1=5 \times 8 \end{array}$$

Verify:

$$(117)_8 = (1 \times 8^2) + (1 \times 8^1) + (7 \times 8^0) = 295 (271)_{10}$$

$$(134)_8 = (1 \times 8^2) + (3 \times 8^1) + (4 \times 8^0) = (92)_{10}$$

$$271 + 92 = (363)_{10} \quad \text{known decimal addition } (363)_{10}$$

$$\begin{array}{r} 271 \\ + 92 \\ \hline (363)_{10} \end{array} \quad \begin{array}{l} (363)_{10} = (363)_8 \text{ known decimal addition } (363)_{10} \\ = (3 \times 8^2) + (6 \times 8^1) + (3 \times 8^0) = 363 (363)_{10} \\ \text{Decimal addition} = \text{octal addition converted into decimal} \\ (363)_{10} = (363)_{10} \end{array}$$

Subtraction:

$$\begin{array}{r} \text{3} \quad \text{8} \quad \text{7} \\ \text{4} \quad \text{1} \quad \text{3} \\ - \quad \text{1} \quad \text{3} \quad \text{4} \\ \hline (\text{2} \quad \text{6} \quad \text{3})_8 \end{array}$$

$$8 \times 1 - 3 = 5 - 3 = 2$$

Verify:

$$\begin{array}{r} 271_{10} \\ - 92_{10} \\ \hline (179)_{10} \end{array}$$

$$(263)_8 = (2 \times 8^2) + (6 \times 8^1) + (3 \times 8^0) = (179)_{10}$$

Decimal Subtraction = Sub Octal Subtraction $\left\{ \begin{array}{l} \text{Converted into} \\ \text{decimal} \end{array} \right\}$

$$(179)_{10} = (179)_{10}$$

Multiplication:

$$\begin{array}{r} \text{1} \quad \text{4} \quad \text{2} \quad \text{1} \\ \text{2} \quad \text{4} \quad \text{3} \quad \text{1} \quad \text{7}_8 \\ \times \quad \text{1} \quad \text{3} \quad \text{4}_8 \\ \hline \text{1} \quad \text{2} \quad \text{0} \quad \text{7} \quad \text{4} \\ \text{1} \quad \text{4} \quad \text{5} \quad \text{5} \quad - \\ + \quad \text{4} \quad \text{1} \quad \text{7} \quad - \quad - \\ \hline (\text{6} \quad \text{0} \quad \text{5} \quad \text{4} \quad \text{4})_8 \end{array}$$

$$7 \times 1 = 7 < 8 \quad | \quad 28/8 = 3$$

$$(7 \times 1) + 3 = 10 < 8$$

$$(7 \times 3) = 21 < 8 \quad | \quad 28/8 = 3$$

$$(7 \times 4) = 28 < 8 \quad | \quad 28/8 = 3$$

$$7 \times 3 = 21 < 8 \quad | \quad 21/8 = 2$$

$$(7 \times 3) + 2 = 23 < 8$$

$$(7 \times 4) = 28 < 8 \quad | \quad 28/8 = 3$$

$$(7 \times 4) + 3 = 31 < 8$$

$$1 \times 7 = 7 < 8$$

$$1 \times 2 = 2 < 8$$

$$4 \times 1 = 4 < 8$$

$$7 + 5 = 12 < 8$$

$$1 + 5 + 7 = 13 < 8$$

$$1 + 2 + 4 + 1 = 8 = 8$$

$$13/8 = 1$$

$$11/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

$$8/8 = 1$$

Verify:

$$\begin{array}{r} 271 \\ \times 92 \\ \hline (24932)_{10} \end{array}$$

$$(60544)_8 = (6 \times 8^4) + (0 \times 8^3) + (5 \times 8^2) + (4 \times 8^1) + (4 \times 8^0) = (24932)_{10}$$

$$(24932)_{10} = (24932)_{10}$$

Decimal Multiplication = Octal Multiplication $\left\{ \begin{array}{l} \text{Converted} \\ \text{into} \\ \text{decimal} \end{array} \right\}$

$$(24932)_{10} = (24932)_{10}$$

$$\begin{aligned}
 & \text{Ex) } 01000010_2 \\
 & = (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) \\
 & \quad + (0 \times 2^0) \\
 & = 2^6 + 2^1 = \underline{\underline{(66)_{10} \text{ (Ans)}}}
 \end{aligned}$$

~~$$\begin{aligned}
 & \text{Q) } 1011100_2 \\
 & = -(01000011)_2 \\
 & = 01000011 \\
 & \quad + 1 \\
 & \quad \underline{\quad \quad \quad} \\
 & \quad (010000100)_2 \\
 & = (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) \\
 & \quad + (0 \times 2^0) + (0 \times 2^{-1}) \\
 & = 2^6 + 2^1 = 2^6 + 2^1 \\
 & = \underline{\underline{(-66) \text{ (Ans)}}}
 \end{aligned}$$~~

$$\begin{aligned}
 & \text{Q) } 1011100_2 \\
 & \text{-ve} \leftarrow \\
 & = (0 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\
 & = 2^5 + 2^4 + 2^3 + 2^2 \\
 & = \underline{\underline{(-60) \text{ (Ans)}}}
 \end{aligned}$$

Using 91 - 199

Division	Quotient	Remainder
91/2	45	1
45/2	22	1
22/2	11	0
11/2	5	1
5/2	2	1
2/2	1	0
1/2	0	1

Division	Quotient	Remainder
199/2	99	1
99/2	49	1
49/2	24	1
24/2	12	0
12/2	6	0
6/2	3	0
3/2	1	1
1/2	0	1

$$(91)_{10} = (1011011)_2$$

$$(199)_{10} = (110001101)_2$$

$$(91)_{10} = (1011011)_2$$

$$= (0001011011)_2$$

$$(199)_{10} = (111110011)_2$$

$$(199)_{10} = (111110011)_2$$

$$-(199)_{10} = (000001101)_2$$

$$(-199)_{10} = (1000001101)_2$$

$$\begin{array}{r} 0001011011 \\ + 100000001101 \\ \hline (1001010101000)_2 \end{array}$$

$$(10010101000)_2 = (0 \times 2^8) + (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$$

$$= (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$$

$$= (-108)_{10}$$

There is an overflow because there is an error in 2's complement system calculation compared to decimal calculation.

(10) (b) 379 + 98

Division	Quotient	Remainder
379/2	189	1
189/2	94	1
94/2	47	0
47/2	23	1
23/2	11	1
11/2	5	1
5/2	2	1
2/2	1	0
1/2	0	1

Division	Quotient	Remainder
98/2	49	0
49/2	24	1
24/2	12	0
12/2	6	0
6/2	3	0
3/2	1	1
2/2	1	0
1/2	0	1

$$(379)_{10} = (101111011)_2$$

$$(379)_{10} = (101111011)_{2's}$$

$$(379)_{10} = (010111101)_{2's}$$

$$(98)_{10} = (1100010)_2$$

$$(98)_{10} = (1100010)_{2's}$$

$$(98)_{10} = (0001100010)_{2's}$$

$$\begin{array}{r} 010111011 \\ + 0001100010 \\ \hline 0111011101 \end{array}_{2's}$$

379

+ 98

+ 477

$$(0111011101)_{2's}$$

← +ve

$$= (2 \times 10^8) + 12$$

$$(1 \times 2^8) + (1 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3)$$

$$+ (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$$

$$= (+477)_{10}$$

There is no overflow because by adding 2 positive numbers, we get a positive number.

(ii) 2 8GB DDR4 RAMs $\rightarrow \$ (1C2)_{16} \times 2$
 RTX $\rightarrow \$ (10010110000)_2$
 Money received by friend $\rightarrow \$ (1064)_8$

$$(1C2)_{16} = (000100011100)_2$$

$$1 - 0001$$

$$2 - 0011$$

$$C - 12 - 1100$$

$$(1 \times 2^8) + (0 \times 2^7) + (0 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) =$$

$$(1C2)_{16} = (1122)_{16} = (00011100000111)_2$$

$$= (1110000011)_2$$

$$(1 \times 2^8) + (1 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) =$$

$$= (450)_{10}$$

$$(10010110000)_2$$

$$= (1 \times 2^9) + (0 \times 2^8) + (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) =$$

$$= (1200)_{10}$$

$$(1064)_8$$

$$= (4 \times 8^3) + (0 \times 8^2) + (6 \times 8^1) + (4 \times 8^0) =$$

$$= (2100)_{10}$$

$$\text{Money remaining} = (2100)_{10} - [(450)_{10} \times 2 + (1200)_{10}]$$

$$= (2100)_{10} - (2100)_{10}$$

$$= \$ (0)_{10} = \$ 0 \text{ (Ans)}$$

$$1200$$

$$900$$

$$\hline 2100$$