ASSIGNMENT # 01

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Department: Computer Science

Section: 2019-23

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"QUESTION NO: 01"

QUESTION: List the octal and hexadecimal numbers from 16 to 32 - Using A and B for the last two digits, list the numbers from 8 to 28 in base 12.

Decimal to Octal & Hexadecimal.

Decimal	Octal	Hexadecimal
16	020	010
17	021	011
18	022	012
19	023	013
20	024	014
21	025	015
22	026	016
23	027	017
24	030	018
25	031	019
26	032	01A
27	033	01B
28	034	01C
29	035	01D

30	036	01E
31	037	01F
32	040	020

Decimal to Base 12

Decimal	Base 12	Decimal	Base 12
08	8	19	17
09	9	20	18
10	A	21	19
11	B	22	1A
12	10	23	1B
13	11	24	20
14	12	25	21
15	13	26	22
16	14	27	23
17	15	28	24
18	16		

Date:

"QUESTION NO : 02"

QUESTION : What is the largest binary number that can be expressed with 16 bits ? what are the equivalent decimal and hexa decimal numbers ?

SOLUTION : 1111111111111111 (16 1's) is the largest binary number that can be expressed with 16 bits.

In decimal Number System

For conversion of a number into decimal number system, we have to multiply each digit with base 2 having its own index. and then sum up the value.

$$= 1\times 2^{15} + 1\times 2^{14} + 1\times 2^{13} + 1\times 2^{12} + 1\times 2^{11} + 1\times 2^{10} + 1\times 2^{9} + 1\times 2^{8} + 1\times 2^{7} + 1\times 2^{6} + 1\times 2^{5} + 1\times 2^{4} + 1\times 2^{3} + 1\times 2^{2} + 1\times 2^{1} + 1\times 2^{0}$$

$$= 32,768 + 16,384 + 8,192 + 4,096 + 2,048 + 512 + 256 + 128 + 69 + 32 + 16 + 8 + 4 + 2 + 1.$$

= 65535.

Hence, 65535 is the value expressed in decimal number system from base 16.

In hexadecimal Number System :

To convert the given number into hexadecimal number system - we have to change it in decimal form - To make it in hexadecimal form, we will divide the number by base 16.

↓

∵ since, we know in hexadecimal number system

15 = F

16	65535
16	4095 - 15
16	255 - 15
	15 - 15

So, the answer for 65535 in hexadecimal form is FFFF.

"QUESTION NO: 03"

QUESTION: Add and multiply the following no's without converting them to decimal.

- Base - 4 numbers 203 and 302.

Addition of Numbers

$(203)_4$
$(302)_4$

1	1	1	1

∵ As we know

4	5
	1-1

Multiplication of Numbers

$(203)_4$
$(302)_4$

	1	0	1	2	
	0	0	0	x	
1	2	2	1	x	x

1	2	3	1	1	2

∵ As we know, in Base - 4 :

6 = 12
4 = 10
9 = 21

"QUESTION NO: 04"

QUESTION: Find the 16's compliment of C3DF

SOLUTION: "Radix compliment"

Formula used = $r^n - N$

$= (16)^4 - C3DF$

$= 10000 - C3DF$

$= 3C21$

r = Base
n = No. of Digits
N = Number

∵ As we know:

16 - F = 01
15 - D = 02
15 - 3 = 12
15 - C = 03

	(15)	(15)	(15)	(16)
1	D	0	0	0
-	C	3	D	F
	3	C	2	1

"QUESTION NO : 05"

QUESTION: Perform subtraction on the given binary number using 2's compliment of the subtrahend - where the result should be -ve, find its 2's compliment and affix a minus sign.

(●). 1001 - 110101.

SOLUTION: Let A = 001001 , B = 110101.

STEP-1: Compliment of subtrahend:

$$= 110101$$
$$= (2^6 - 1) - 110101$$
$$= 111111 - 110101$$
$$= 001010$$

$2^6 = 1000000$

```
  1 1 1 1 1 2
1 0 0 0 0 0 0
          - 1
-------------
  1 1 1 1 1 1
- 1 1 0 1 0 1
-------------
  0 0 1 0 1 0
```

STEP - 2 : 2's complimend of subtrahend :

$= 001010 + 1.$

$= 001011.$

STEP - 3 : Add minued and 2's compliment of subtrahend.

$= 001001 + 001011$

$= 010100.$

①	①	①			
0	0	1	0	0	1
0	0	1	0	1	1
0	1	0	1	0	0

STEP - 4 : If end carry exist, then add that carry to LSB of the result - If it doesn't, then take compliment of result and take minus sign before.

As end carry doesn't exist, so taking compliment of the answer - we get :

WAY - 1

$= (2^6) - 010100$

$= 1000000 - 010100$

$= 101100$

Affix minus sign.

$= -101100$

WAY - 2

$\Rightarrow 001001 - 110101$

$= -[2\text{'s compliment of } 010100]$

2's compliment of 010100 is 101100.

$= -101100$

"QUESTION NO: 06"

QUESTION: The state of a 12 bit register is 100010010111 - what is its content if it represents:

(i)- Three decimal digit in BCD

(ii)- Three decimal digits in the excess-3 code?

SOLUTION: **In BCD.**

8	4	2	1
1	0	0	0
1	0	0	1
0	1	1	1

STEP-1: To convert the digits into BCD code, we have to make pair of 4, 4 digits.

STEP-2: Adding the binary codes to the digits, we will get the required answer.

$1000 = 8+0+0+0 = 8$

$1001 = 8+0+0+1 = 9$

$0111 = 0+4+2+1 = 7$

So, In BCD 100010010111 is equal to '897'.

In excess-3

In Excess-3, we have to subtract the binary code of 3 from the given digits - Or, simply subtract their binary codes.

$1000 - 0011 = 0101$ → In BCD
$8 - 3 = 5$ → In Excess-3

$1001 - 0011 = 0110$
$9 - 3 = 6$

$0111 - 0011 = 0100$
$7 - 3 = 4$

So, the Excess-3 of 100010010111 is '564'.

Date:

"QUESTION NO: 07"

QUESTION : Simplify the following boolean expression to a minimum number of literals.

(i). $(a+b+c')(a'b'+c)$
(ii). $a'bc + abc' + abc + a'bc'$
(iii). $ABC'D + A'BD + ABCD$ (upto two literals)

(i). $(a+b+c')(a'b'+c)$

$= (a+b+c')(a'b'+c)$

$= aa'b' + ac + a'bb' + bc + a'b'c' + cc'$

∵ As we know $x \cdot x' = 0$

$= (a \cdot a')b' + ac + a'(b \cdot b') + bc + a'b'c' + c \cdot c'$

$= 0 + ac + 0 + bc + a'b'c' + 0$

$= a'b'c' + ac + bc$

$= a'b'c' + c(a+b)$

DARSI NOTES

(ii). $a'bc + abc' + abc + a'bc'$

$= a'bc + abc + abc' + a'bc'$

$= bc(a+a') + bc'(a+a')$

∵ As we know $x + x' = 1$

$= bc + bc'$

$= b(c+c') = b$

(iii). $ABC'D + A'BD + ABCD$

$= ABC'D + ABCD + A'BD$

$= ABD(c'+c) + A'BD$

∵ As we know $x + x' = 1$

$= ABD + A'BD$

$= BD(A+A')$

$= BD$ (upto Two Literals)