ASSESSMENT - 1

NUMBER SYSTEMS - SOLUTIONS

1. How is 2's complement used in subtraction? If the answer is negative, how can you find its magnitude? (1)

   Ans: A-B is the same as A+(2's complement of B). Hence using 2's complement method we can perform the subtraction of 2 numbers by simple addition. The MSB bit will indicate the sign. If it is 1 then the number is negative else it is positive.

2. Convert $(FA27D)_{16}$ to decimal, octal and binary representation (2)

   Ans:

   $(FA27D)_{16} = (1024637)_{10}$

   $(FA27D)_{16} = (1111\ 1010\ 0010\ 0111\ 1101)_2$

   $(FA27D)_{16} = (3721175)_8$

3. Convert $(8620)_{10}$ to BCD, Excess-3, Binary and 2421 (2)

   Ans:

   BCD = 1000 0110 0010 0000

   Excess-3 = 1011 1001 0101 0011

   Binary = 10000110101100

   2421 = 1110 1100 0010 0000

4. Convert the decimal number 25.375 to its binary equivalent. (1)

   Ans: $(11001.011)_2$

5. Perform the indicated operations in binary: (2)
   a. $(32)_8 + (73)_8$ - Convert octal notation to binary notation and then perform addition operation

b. $(175)_8 – (114)_8$ - Convert octal notation to binary notation and then perform subtraction operation

c. $(7E)_{16} + (AD)_{16}$ - Convert hexadecimal notation to binary notation and then perform addition operation

d. $(BC)_{16} – (F4)_{16}$ - Convert hexadecimal notation to binary notation and then perform subtraction operation

Ans:

a. $(32)_8 = (11010)_2$

$(73)_8 = (111011)_2$

$(11010)_2 + (111011)_2 = (1010101)_2$

b. $(175)_8 = (1111101)_2$

$(114)_8 = (1001100)_2$

$(1111101)_2 - (1001100)_2 = (0110001)_2$

c. $(7E)_{16} = (01111110)_2$

$(AD)_{16} = (10101101)_2$

$(01111110)_2 + (10101101)_2 = (100101011)_2$

d. $(BC)_{16} = (10111100)_2$

$(F4)_{16} = (11110100)_2$

$(10111100)_2 - (11110100)_2 = (000111000)_2$

6. Subtract using 1's and 2's complement method: (2)
   a. $(10)_{10}$ from $(15)_{10}$
   b. $(57)_{10}$ from $(85)_{10}$

Ans: a. $(15)_{10}$ = (1111)2

$(10)_{10} = (1010)_2$

1's complement method

take 1's complement of $(1010)_2$ we get, $(0101)_2$

01111
10101
_____
100100
1
_____
00101

2's complement method

take 2's complement of $(1010)_2$ we get, $(0110)_2$

01111
10110
_____
100101 discard the carry we get $(00101)_2$

b. $(57)_{10}$ from $(85)_{10}$

$(85)_{10} = (1010101)_2$

$(57)_{10} = (0111001)_2$

1's complement method

take 1's complement of $(0111001)_2$ we get, $(1000110)_2$

01010101
11000110
_____
100011011
1
_____
00011100

2's complement method

take 2's complement of $(0111001)_2$ we get, $(1000111)_2$

01010101
11000111

_____

100011100 discard the carry we get $(00011100)_2$

7. Obtain the 9's complement of the following decimal numbers: (2)
   a. $(459862)_{10}$
   b. $(0147999)_{10}$

   Ans:

   a. $(459862)_{10} = (540137)_{10}$
   b. $(0147999)_{10} = (9852000)_{10}$

8. Perform the following conversions: (3)
   a. 5456 from octal to hexadecimal
   b. 16038 from decimal to octal
   c. F3B7 from hexadecimal to binary

   Ans:

   a. $(B2E)_{16}$
   b. $(37246)_8$
   c. $(1111001110110111)_2$

9. Convert 34 from octal notation to binary notation and represent the result in 8 bits (2)

   Ans:

   $(34)_8 = (11100)_2$

   8 bit representation : $(00011100)_2$

10. Convert the following gray codes to their binary representation:(2)
    a. 101011
    b. 011111010

    Ans:

    a. 110001—>110010
    b. 010101100

11. Convert $(12.345)_{10}$ (3)
    a. To binary
    b. To Hexadecimal
    c. To Octal representation

Ans :

a. $(1100.010110000101000111111)_2$

b. $(C.585)_{16}$

c. $(14.2605)_8$

12. Perform binary subtraction of (2)
    a. $(FA)_{16}$ - $(BC)_{16}$
    b. $(A8F)_{16}$ - $(BE4)_{16}$

Ans :

a. $(00111110)_2$

b. $(000101010101)_2$

13. Represent the following in 2s complement method (2)
    a. $(0.111011)_2$
    b. $(1010.1010)_2$

Ans:

a. 0.000101
b. 0101.0110

14. Perform 2s complement subtraction (2)
    a. $(2.45)_{10}$ - $(8.65)_{10}$
    b. $(3.985)_{10}$ - $(10.234)_{10}$

Ans:

2's complement method

a.

take 2s complement of 8.65, we get 0111.010111
0010.011100
0111.010111

1001.110011 —> $(-6.203125)_{10}$
After 2s complement 0110.001101

b.

take 2s complement of 10.234 we get, 0101.11001
0011.11111

0101.11001

_____

1001.11000 —> $(-6.25)_{10}$

After 2s complement 0110.01000

15. Perform $(456)_8$ - $(CD)_{16}$ and represent the result in 12-bit register (3)

Ans: $(456)_8 = (100101110)_2$

$(CD)_8 = (011001101)_2$

Take 2s complement of CD we get 100110011

100101110

100110011

_____

1001100001 discard the carry we get 001100001

12 bit register will hold it as 000001100001

16. Display -104 in a signed 12 bit register and perform binary to gray code conversion (3)

Ans:

$(104)_{10} = (000001101000)_2$

Its 2s complement will be $(111110011000)_2$

and its gray code equivalent will be: $(100001010100)_2$

17. Show the value of all bits of a register that hold the number equivalent to a decimal number 65 in: (4)
    a. binary(represent it in a 8 bit register)
    b. excess-3 (represent it in a 12 bit register)
    c. 2421 code (represent it in a 12 bit register)
    d. binary coded decimal (BCD).(represent it in a 10 bit register)

Ans:

a. $(01000001)_2$
b. $(000010011000)_2$
c. $(000011001011)_2$

   Or (0000000001100101)2
d. $(0001100101)_2$

18. Consider the equation $(123)_5 = (x8)_{10}$ with x as unknown. What will be the value of x?(HINT: Convert both sides to radix 10) (2)

Ans:

$(123)_5 = (x8)_{10}$

$1*5^2 + 2*5 + 3 = x*10 + 8$

$25 + 10 + 3 = x*10 + 8$

$38 - 8 = x*10$

$x = 3$

1.