



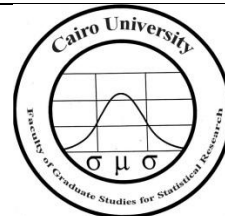
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Cairo University
Faculty of Graduate studies for Statistical Research

Department: Computer Science

CS500

Sheet#1 (Answer)



Q1: find the equivalent decimal values for the following numbers considering their numbering systems:

a) $(101111)_2 \Rightarrow (47)_{10}$

b) $(100111.101)_2 \Rightarrow (39.625)_{10}$

c) $(2201)_3 \Rightarrow (73)_{10}$

d) $(1320.321)_4 \Rightarrow (120.890625)_{10}$

e) $(1276)_8 \Rightarrow (702)_{10}$

f) $(545.432)_8 \Rightarrow (357.5507813)_{10}$

g) $(6D2F)_{16} \Rightarrow (27951)_{10}$

h) $(BC7.E3)_{16} \Rightarrow (3015.886719)_{10}$

Q2 : convert the following decimal numbers to their equivalent binary , ternary, octal and hexadecimal numbers_with a precision of 4- digits :

(1) $(3445)_{10}$

$= (110101110101)_2 = (11201121)_3 = (6565)_8 = (D75)_{16}$

(2) $(879.345)_{10}$

$= (1101101111.0101)_2 = (1012120.1000)_3 = (1557.2605)_8 = (36F.5851)_{16}$



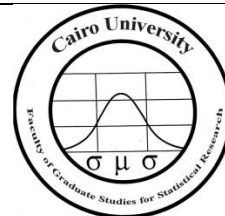
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Sheet#1 **(Answer)**



Q3 : Convert the binary number $(10101111.0101)_2$ to its equivalent octal and hexadecimal numbers.

$$= (257.24)_8 = (AF.5)_{16}$$

Q4. Calculate the result of the following binary subtraction operation in direct, 1's complement and 2's complement methods:

a. $11101 - 111101$

b. $1101.1111 - 11010.11001$

a) $011101 - 111101$

1) (Direct subtraction)

011101

- 111101

011101

-100000

2) (Using 1's complement)

011101

+ 000010 \rightarrow 1's complement

011111

The result = - 1's complement of (011111) = -100000

3) (using 2's complement)

011101

+ 000011 \rightarrow 2's complement

100000

The result = - 2's complement of (100000) = -100000



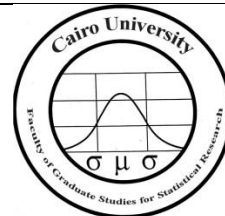
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Sheet#1 (Answer)



b) 01101.11110 – 11010.11001

1) (Direct subtraction)

$$\begin{array}{r} 01101.11110 \\ - 11010.11001 \\ \hline 01101.11110 \\ - 01100.11011 \end{array}$$

2) (Using 1's complement)

$$\begin{array}{r} 01101.11110 \\ + 00101.00110 \rightarrow 1's \text{ complement} \\ \hline 10011.00100 \end{array}$$

→ The result = - 1's complement of (10011.00100) = - 01100.11011

3) (using 2's complement)

$$\begin{array}{r} 01101.11110 \\ + 00101.00111 \rightarrow 2's \text{ complement} \\ \hline 10011.00101 \end{array}$$

→ The result = - 2's complement of (10011.00101) = - 01100.11011



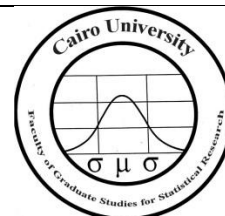
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Sheet#1 (Answer)



Q5) Obtain the 5-bit binary number of the decimal numbers (−12, −9 , +9) in the following representation systems:

- a) Unsigned binary notation
- b) signed-magnitude notation
- c) signed-1's complement notation
- d) signed-2's complement notation
- e) Excess notation

Method	-12	- 9	+ 9
Unsigned binary notation	(01100)	(01001)	(01001)
signed-magnitude notation	(11100)	(11001)	(01001)
signed-1's complement notation	= 1's com. of (01100) = (10011)	= 1's com. of (01001) = (10110)	(01001)
signed-2's complement notation	= 2's com. of (01100) = (10100)	= 2's com. of (01001) = (10111)	(01001)
Excess notation (for 5 bits, we will use excess 16)	= -12 + 16 = 4 = 00100	= -9 + 16 = 7 = 00111	(01001)



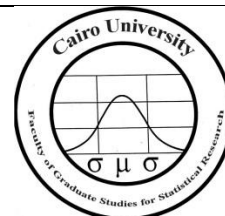
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Sheet#1 (Answer)



Q6) Obtain the decimal value of the binary number $(11011001.001)_2$ in case of:

- a) unsigned binary notation
- b) signed-magnitude notation
- c) signed-1's complement notation
- d) signed-2's complement notation

Method	$(11011001.001)_2$
Unsigned binary notation	$(217.125)_{10}$
signed-magnitude notation	$(-89.125)_{10}$
signed-1's complement notation	$\begin{aligned} &= -1's \text{ com. of } (11011001.001) \\ &= -(00100110.110) \\ &= (-38.75)_{10} \end{aligned}$
signed-2's complement notation	$\begin{aligned} &= -2's \text{ com. of } (11011001.001) \\ &= -(00100110.111) \\ &= (-38.875)_{10} \end{aligned}$