Digital logic PyQ on Number system

Qw 1 gate 1991

Consider the ~~given~~ number given by the decimal expression:

$$16^3 * 9 + 16^2 * 7 + 16 * 5 + 3$$

The number of 1's in the unsigned binary representation of the number is ___ ?

$$(9753)_{16}$$

$$(1001\ 0111\ 0101\ 0011)_2 \Rightarrow 9 \text{ Ans}$$

Qw 2 gate 1991

when two 4bit number $A = a_3a_2a_1a_0$ and $B = b_3b_2b_1b_0$ are multiplied the bit C_1 of the product C is given by

$$\begin{array}{r} a_3\ a_2\ a_1\ a_0 \\ b_3\ b_2\ b_1\ b_0 \\ \times \\ \hline a_3b_0\ a_2b_0\ a_1b_0\ a_0b_0 \end{array}$$

$$\begin{array}{lllll} a_3b_1 & a_2b_1 & a_1b_1 & a_0b_1 & \times \\ a_3b_2 & a_2b_2 & a_1b_2 & a_0b_2 & \times\ \times \\ a_3b_3 & a_2b_3 & a_1b_3 & a_0b_3 & \times\ \times\ \times \\ \hline C_6 & C_5 & C_4 & C_3 & C_2\ C_1\ C_0 \end{array}$$

symbol for XOR gate

$a_1b_0 \oplus a_0b_1$ Ans → C_1

$1+1 \rightarrow 0$
$1+0 \rightarrow 1$
$0+1 \rightarrow 1$
$0+0 \rightarrow 0$

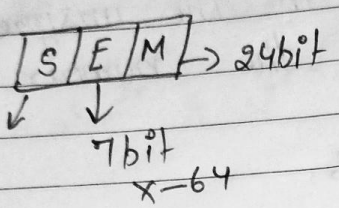
XOR's Truth table

possibility for a_1b_0 and a_0b_1

Qw 3 1990

A 32bit floating-point number is represented by 7 bit signed exponent and a 24 bit fractional mantisa. The base of the scale factor is 16.
The range of the exponent is ____ if the scale factor is represented in excess 64 format

Sol:



Range: 0 ~~1111111~~

Exponent bits 7. So the minimum it could be all 7 bit 0's and maximum it could be all 1's

-64 to 63 Range Ans

Qw 4 gate 1990

A 32bit floating-point number is represented by 7bit signed exponent and 24bit fractional mantisa. The base of the scale factor is 16
The range of the exponent is ____.

Sol: By default we use 2's complement for -ve no

-2^{7-1} to $2^{7-1}-1$ => -64 to 63

Ans

Que 5 gate 1994

Consider n bit (including sign bit) 2's Complement representation of integer numbers. The range of integer value N that can be represented is ___ ≤N≤ ___

Sol 2^{n-1} to $2^{n-1}-1$ Ans

Que 6 gate 1995

The number of 1's in the binary representation of $(3*4096 + 15*256 + 5*16 + 3)$ are

Sol $(3F53)_{16}$

$2+4+2+2 = 10$ Ans

Que 7 gate 1996

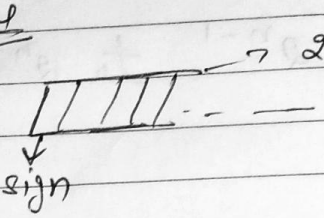
~~The~~ ~~expo~~ Consider the following floating point number representation.

31	24	23	0
exponent		Mantisa	

The exponent is in 2's Complement representation and the mantisa is in the sign magnitude representation. The range of the number in magnitude of the normalized this representation is

asking for mantissa

A. 0 to 1
B. 0.5 to 1
C. 2^{-23} to 0.5
D. 0.5 to $(1-2^{-23})$ Ans



smallest no. .1000 ---
.5 in decimal

largest no. .1111 ---

So ans is 0.5 to $1-2^{-23}$ Ans

Q.8 Range of numbers in the normalized form:

$2^{8-1}-1$ to 2^{8-1}

127 to -128

$.5 * 2^{-128}$ to $(1-2^{-23}) * 2^{127}$

Ques 8 1997

given $\sqrt{(224)_r} = (13)_r$

The value of radix r is:

a) 10
b) 8
c) 5
d) 6

Sol: $\sqrt{2r^2+2r+4} = r+3$ ⇒ Converted into base 10

~~$2r^2+5r+4$~~

Take square on both sides

$$2r^2+2r+4 = r^2+6r+9$$
$$r^2-4r-5 = 0$$

Apply formula $(a+b)^2$ wher a is r and b is 3

$$r^2-5r+r-5 = 0$$
$$(r-5)(r+1)$$

$r = 5$ Ans

Qu 9 Gate 1999

Zero has two representation in

a) Sign - magnitude ✓
b) 2's Complement
c) 1's " ✓
d) None of the Above

Qu 10 2000

The number 43 in 2's Complement representation is

43's binary
$(00101011)_2$

2's Complement
11010101

A 01010101
b 11010101 ✓ Ans
C 00101011
D 10101011

Qu 11 2000

Consider the following values of $A = 2.0 \times 10^{30}$, $B = -2.0 \times 10^{30}$, $C = 1.0$ and the sequence

$X := A + B \rightarrow 0$
$X = X + C \rightarrow 1$
$y = A + C \rightarrow A$
$y = y + B \rightarrow 0$

executed on a computer where floating point number are represented with 32 bits. The values for X and y will be

A) $x = 1.0$, $y = 1.0$
B) $x = 1.0$, $y = 0.0$ ✓
C) $x = 0.0$, $y = 1.0$
D) $x = 0.0$, $y = 0.0$

Que 12 2001

The 2's Complement representation of $(-539)_{10}$ in hexadecimal is

A) ABE
B) DBC
C) DE5 ✓
D) 9E7

$(539)_{10} \Rightarrow (1000011011)_2$

2's Complement $\Rightarrow$
1101111100101

DE5 Ans

Que 13 @ 2002

The decimal value of 0.25

A) is equivalent to the binary 0.1 ✓
B) " " " 0.01
C) " " " 0.00111
D) Cannot be represented in Binary