

Digital logic Pg 8

2 The 2's complement representation of the decimal value -15 is

six bit 0111 \rightarrow +ve 15

10001 -15 Ans

gate 2002

2 Sign extension is a step in

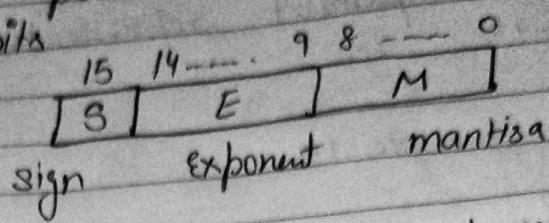
- a) floating point multiplication
- b) signed 16 bit integer addition
- c) arithmetic left shift
- d) converting a signed integer from one size to another ✓

3 Assuming all numbers are in 2's complement which of the following number is divisible by 11111011? $\Rightarrow -00101 = -5$

- a) 11100111 $\rightarrow 011001 = -25$ ✓ Ans
- b) 11100100 $\rightarrow -011100 = -28$
- c) 11010111 $\rightarrow 00101001 = -41$
- d) 11011011 $\rightarrow 00100101 = -37$

gate 2003

gate 2023/4 The following is a scheme for the floating point number representation using 16 bits



Let s , e , and m be the numbers represented in binary in the sign, exponent and mantissa fields respectively. Then the floating point number represented is

$$[(-1)^s (1 + m \times 2^{-9}) 2^{e-31}], \text{ if the exponent is } e \\ \text{otherwise}$$

what is the maximum difference between two successive real numbers representable in this system

- A) 2^{-40}
- B) 2^{-9}
- C) 2^{22}
- D) 2^{31}

gate 2004 / 5 If 73_n (in base n system) is equal to 54_y (in base y -number system) then possible value of n and y are

- A) 8, 16
- B) 10, 12
- C) 9, 13
- D) 8, 11

$$(73)_n = (54)_y$$

$$7n + \frac{3}{n} = 5y + 4$$

$$7n - 5y = 4 - 3$$

$$7n - 5y = 1$$

Now put all bases given in option as
 n any and $y = 1$

$$7 \times 8 - 5 \times 1 = 1$$

$$56 - 5 = 1 \quad \underline{\text{Ans}}$$

gate 2004 / 6

= what is the result of evaluating the following two expressions using three-digit floating point arithmetic with rounding

$$(113. + -111.) + 7.51$$

$$113. + (-111. + 7.51)$$

A) 9.51 and 10.0 respectively ✓

B) 10.0 and 9.51 " X

C) 9.51 and 9.51 " X

D) 10.0 and 10.0 " X

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$$(113. + -111.) + 7.51$$

$$2 + 7.51 = 9.00 + 7.51 = 9.51 \quad \underline{\text{due}}$$

$$113. + (-111. + 7.51)$$

$$-1.11 \times 10^2 + 7.51 \times 10^0$$

$$-1.11 \times 10^2 + .0751 \times 10^2$$

$$-1.11 \times 10^2 + .08 \times 10^2$$

~~cancel~~ ~~$\times 10^2$~~

$$1.03 \times 10^2$$

$$1.03 \times 10^2 - 1.03 \times 10^2$$

$$0.10 \times 10^2 = 10 \quad \underline{\text{due}}$$

gate 2004/7 Let A = 1111010 and B 00001010
 be two 8-bit 2's complement numbers
 Their product in 2's complement is

- | | | |
|-------------|---|---------------------------------|
| A) 11000100 | ✓ | <u>$\frac{1}{2}$</u> |
| B) 10011100 | | |
| C) 10100101 | | |
| D) 11010101 | | |

A) 1111010	
- 00110	= -6
B) 00001010 = 10	
- 6 \times 10 = -60	

$$00111100 = +60$$

$$\underbrace{11000100}_{\text{Ans}} = -60 \quad \underline{\text{due}}$$

gate 2004 The number $(123456)_8$ is equivalent to

- A $(A72E)_{16}$ and $(22130232)_8$ ✓ ~~Ans~~
- B $(A72E)_{16}$ and $(22131122)_4$
- C $(A73E)_{16}$ and $(22130232)_4$
- D $(A62E)_{16}$ and $(22120232)_4$

$$(123456)_8 = \underbrace{001}_{A} \underbrace{010011}_{7} \underbrace{100}_{2} \underbrace{1110}_{E}$$

gate 2005 The range of integers that can be represented by an n bit 2's complement number system is:

- A -2^{n-1} to $(2^{n-1}-1)$ ✓ ~~Ans~~
- B ~~-2^n~~ $-(2^{n-1}-1)$ to $(2^{n-1}-1)$
- C -2^{n-1} to 2^{n-1}
- D $-(2^{n-1}+1)$ to $(2^{n-1}-1)$

$$\text{SMR } 1's \Rightarrow \begin{array}{c} \text{sign bit} \\ -2^{n-1}-1 \text{ to } 2^{n-1}-1 \\ \downarrow \\ \text{for re } 0 \end{array} \quad \begin{array}{c} \text{sign bit} \\ -2^{n-1}-1 \text{ to } 2^{n-1}-1 \\ \downarrow \\ \text{for +ve } 0 \end{array}$$

$$2's \rightarrow -2^{n-1} \text{ to } 2^{n-1}-1$$

only one representation of "0"

gate 2005 The hexadecimal representation of $(657)_8$ is

$$(657)_8$$

$$(11010\ \underline{111})_2$$

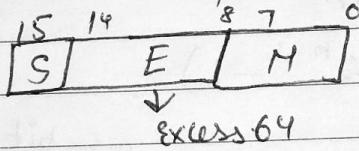
- A 7AF ✓
- B D78
- C D71
- D 32F

$$7A F \quad \text{Ans} \rightarrow$$

gate 2005 $(34.4)_8 \times (23.4)_8$ evaluates to

- | | | | | |
|---|---------------|---|------------|--------------------------------------|
| A | $(1053.6)_8$ | ✓ | <u>Ans</u> | 344 |
| B | $(1053.2)_8$ | | | 234 |
| C | $(10242)_8$ | | | 1620 |
| D | None of these | | | 1254 X
710 X X
<u>105 3.60</u> |

gate 2005 Consider the following floating-point format



Mantissa is a pure form fraction in sign-magnitude form

The decimal number 0.239×2^{13} has the following hexadecimal representation (without normalization and rounding off):

- A 0D24
- B 0D 4D
- C 4D 0D
- D 4D 3D ✓

$$(0.239)_{10} - \begin{array}{r} 0.239 \\ \times 2 \\ \hline 0.478 \end{array} \quad \begin{array}{r} 0.478 \\ \times 2 \\ \hline 0.956 \end{array} \quad \begin{array}{r} 0.956 \\ \times 2 \\ \hline 1.912 \end{array}$$

$$\begin{array}{r} 0.912 \\ \times 2 \\ \hline 1.824 \end{array} \quad \begin{array}{r} 0.824 \\ \times 2 \\ \hline 1.648 \end{array} \quad \begin{array}{r} 0.648 \\ \times 2 \\ \hline 1.296 \end{array} \quad \begin{array}{r} 0.296 \\ \times 2 \\ \hline 0.592 \end{array}$$

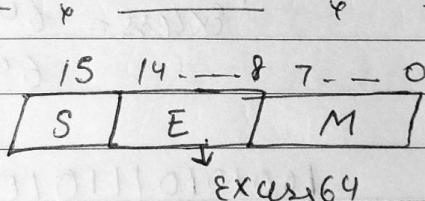
$$\begin{array}{r} 0.592 \\ \times 2 \\ \hline 1.184 \end{array}$$

$$(0.239)_{10} \rightarrow (0011101)_2$$

$$Ex - 64 + 13 \rightarrow \underbrace{100}_{4} \underbrace{110}_{D} \underbrace{1}_{3} \underbrace{001}_{D} \underbrace{111}_{D} \underbrace{01}$$

4 D 3 D

gate 2005



The normalized representation for the above format is specified as follow. The mantissa has an implicit 1 preceding the binary (radix) point. Assume that only 0's are padded in while shifting a field.

The normalized representation of the above number (0.239×2^{13}) is:

- A 0A 20
B 11 34
C 49 D0
D 4A E8 ✓

$$0.239 \times 2 = 0.478$$

$$0.478 \times 2 = 0.956$$

$$0.956 \times 2 = 1.912$$

$$0.912 \times 2 = 1.824$$

$$0.824 \times 2 = 1.648$$

$$0.648 \times 2 = 1.296$$

$$0.296 \times 2 = 0.592$$

$$0.592 \times 2 = 1.184$$

8 digit because mention of 8 bit

0011 1101

$$0.0011101 \times 2^{13}$$

in normalized form = 1.1101000×2^{10}

exponent = 10

excess = 64

$$64 + 10 = 74$$

$$\begin{array}{r} 100101011101000 \\ \hline 4 \quad A \quad E \quad 8 \end{array} = (4AE8)_{16}$$

Ans

gate 2006: The addition of 4 bit two's complement binary numbers 1101 and 0100 result in:

A 0001 and an overflow
B 1001 " no ✓
C 0001 " 70 an " ✓
D 1001 " 00 " "

$$\begin{array}{r} & & & 0100 \\ & & & \hline 1101 & & & \\ & & & \underline{0001} \\ & & & \underline{\underline{00}} \end{array}$$

gate 2007 $(C012 \cdot 25)_H - (10111001110 \cdot 101)_B$

A $(135/103 \cdot 412)_0$ ✓ Ans
B $(564611 \cdot 412)_0$
C $(564411 \cdot 205)_0$
D $(135/103 \cdot 205)_0$

$$(C012 \cdot 25)_H \rightarrow \begin{array}{l} 1100000000010010 \cdot 00100101 \\ 10111001110 \cdot 10100000 \\ 10111010010000111 \cdot 100001010 \\ \hline 3 \cdot 4 \cdot 12 \end{array}$$

gate 2008 The following bit pattern represent a floating point number in IEEE 754 single precision format

S E M

$$1 1000011 101000000000 \dots$$
$$-1.101 \times 2^4 = -11010 = -26$$

Ans

gate 2008 In the IEEE floating point representation
 the hexadecimal value $0x\ 0000\ 0000$
 corresponds to

- A The normalized value 2^{-127}
- B " " " 2^{-126}
- C " " " "+0
- D The special value "+0" ✓

gate 2008 Let r denote number radix. The only value of r that satisfy the equation $\sqrt{121}r^2 = 11r$ is:

- A decimal 10
- B " "
- C " 10 and 11
- D any value > 2

$$\sqrt{r^2 + 2r + 1}$$

$$\sqrt{(r+1)^2}$$

$$r+1 = (11)_r$$