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IDS (Question Bank)

1. Which gates are called as the Universal Gates? What are its advantages?

An 1. NAND and 2. NOR gates are called as the Universal Gates

Its advantages is that they are economical and easier to fabricate and are the basic gates used in all IC digital logic families

2. Explain classification of Number system.

An

Number System
- Weighted Number System
  - Decimal
  - Octal
  - Binary
  - Hexadecimal
- Non-Weighted Number Systems
  - Gray Code
  - Excess-3-Code

3. Explain about Diminished Radix complement.

Ans If r is the base of the number system, then there are two types of complements that are possible i.e. r's and $(r-1)$'s. The $(r-1)$'s complement is known as Diminished Radix Complement.

$$(r-1)\text{'s complement} = \{(r^n)\,10^{-1}\} - N$$

n = number of digits in the number
N = is the given number
r = base of the number

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4 What is meant by parity bit?

Ans A parity bit is a bit, with a value of 0 or 1, that is added to a block of data for error detection purposes. It gives the data either an odd or even parity.

Parity bits are often used in data transmission to ensure the data is not corrupted during the transfer process

5 Define duality property.

Ans According to this principle, if we have postulates or theorems of Boolean Algebra for one type of operation then that operation can be converted into another type of operation

i.e.

AND can be converted to OR and vice-versa. just interchanging '0 with 1', '1 with 0', (+) sign with (.) sign and '(.) sign with (+) sign

6 Perform (-50)-(-10) in binary using the signed-2's complement.

Ans

7. Determine the value of base x if $(211)_x = (152)_8$.

An

$$(211)_x = (152)_8$$

$$\Rightarrow 2\times x^2 + 1\times x^1 + 1\times x^0 = 1\times 8^2 + 5\times 8^1 + 2\times 8^0$$

$$\Rightarrow 2x^2 + x + 1 = 64 + 40 + 2$$

$$\Rightarrow 2x^2 + x + 1 - 64 - 40 - 2 = 0$$

$$\Rightarrow 2x^2 + x - 105 = 0$$

$$\Rightarrow x = \frac{-b \pm \sqrt{(1)^2 - 4(2)(-105)}}{2\times 2}$$

$$\Rightarrow x = \frac{-1 \pm \sqrt{1 + 840}}{4}$$

$$\Rightarrow x = \frac{-1 \pm (29)}{4}$$

$$x = 7$$ Ans

8. Define binary logic?

Ans Binary logic is the basis of electronic systems, such as computers and cell phones. It works on 0's and 1's.

It involves addition, subtraction, multiplication, division of zeros and ones.

It includes logic gates functions, AND, OR and NOT which translates input signals into specific output.

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Represent the decimal number 3452 in
i) BCD ii) Excess - 3

12. State and Explain the DeMorgan's Theorem.
Ans) DeMorgan's Theorem explains that the complement of the product of all the terms is equal to the sum of the complement of each term.
i.e.

$$\overline{AB} = \overline{A} + \overline{B}.$$

$$\overline{A+B} = \overline{A} \ \overline{B}$$

The complement of the sum of all the terms is equal to the product of the complement of each term.

According to this theorem,
a NAND gate is equivalent to an OR gate with inverted inputs.

Similarly,
a NOR gate is equivalent to an AND gate with inverted inputs.

13 Evaluate $(198)_{12} + (12121)_3 = (\quad)_8$

Ans

$(198)_{12}$

$= 1 \times 12^2 + 9 \times 12 + 8 \times 12^0$

$= 144 + 108 + 8 = 260$

$(12121)_3$

$= 1 \times 3^4 + 2 \times 3^3 + 1 \times 3^2 + 2 \times 3^1 + 1 \times 3^0$

$= 81 + 54 + 9 + 6 + 1$

$= 151$

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14. Define Associative Law and Distributive Law ?

Ans Associative Law

:- The addition or multiplication of three numbers is independent of their grouping or association.

or

The grouping or combination of three numbers while adding or multiplying them doesn't change the result.

e.g $A+(B+C) = (A+B)+C$

$A\times(B\times C) = (A\times B)\times C$

Distributive law

:- The product of a number with a sum is equal to the sum of the products of the number with each term under the addition

: $x(y+z) = xy+xz$

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19 Realize 2 input X-NOR gate using NAND gates only.

Ans

Inputs	Output
A, B	$(AB)'$
A, $(AB)'$	$(A(AB)')'$
$(AB)'$, B	$(B(AB)')'$

$(A(AB')'$, $(B(AB)')'$ $A'B + AB'$

Now the output from gate no 4 is the overall output of the configuration.

$$Y = ((A(AB)')' (B(AB)')')'$$
$$= (A(AB')'' + (B(AB)')''$$
$$= (A(AB)') + (B(AB)')$$

$$= (A(A'+B)') + (B(A'+B'))$$
$$= (AA' + AB') + (BA' + BB')$$

$$= (0 + AB' + BA' + 0)$$
$$= AB' + BA'$$
$$Y = AB' + A'B$$

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20 Realize 2 input X-OR gate using NOR gates only.

Ans From De Morgan's theorems

$$(A+B)' = A'B'$$
$$(A'+B')' = A''B'' = AB$$

Gate No	Inputs	Output
1	A, B	$(A+B)'$
2	$A, (A+B)'$	$(A+(A+B)')'$
3	$(A+B)', B$	$(B+(A+B)')'$
4	$(A+(A+B)')', (B+(A+B)')'$	$AB+A'B'$