PHYSICS

BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

DIGITAL CIRCUITS

Example

1. Write the decimal equivalent of $(101101)_2$.

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2. Addition: $(1100.101)_2 + (1001.11)_2 + (11.01)_2$

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3. Addition: $(1000001)_2 + (11111)_2$

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4. Subtraction: $(1100.101)_2 - (1001.11)_2$

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5. Subtraction: $(1000001)_2 - (11111)_2$

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Section Related Questions

1. What do you mean by analogue and digital circuits ?

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2. What is the nature of the waveform of analogue signal? Explain with an example.

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3. What is the nature of the waveform of digital signal? Discuss with an example.

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4. What do you mean by positive and negative logics in case of digital signal?

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5. On what factors does the value of a number depend?

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6. What do yor mean by number system?

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7. Explain with example the rules to represent integer or fraction in (i) decimal system and (ii) binary system.

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8. Give an example of conversion of integer (i) from decimal to binary and (ii) from binary to decimal.

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9. Give an example of conversion of fraction (i) from decimal to binary and (ii) from binary to decimal.

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10. Why are electronic gates called logic gates?

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11. Mention the equations of Boolean algebra for OR, AND and NOT gates.

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12. Draw the circuit diagrams of AND and NOT gates.

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13. Draw the circuit diagram of an OR gate using p-n junction diodes. Write down the table ofan OR gate.

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14. Draw the symbols of OR, AND and NOT gates.

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15. Show the logic symbol and truth table of:

(i) OR gate (ii) AND gate (iii) NOT gate.

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16. Show the truth table of a 2-input OR gate.

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17. Mention the equations of Boolean algebra for NOR and NAND gates. Draw the symbols of these two gates.

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18. Define an OR gate and explain its truth table.

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19. Define an AND gate and explain its truth table.

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20. Define an NOT gate and explain its truth table.

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21. How can an OR gate be constructed by using p-n junctions? Explain with circuit diagram.

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22. How can an AND gate be constructed by using p-n junctions? Explain with circuit diagram.

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23. Explain with the help of a diagram, how you would construct a NOT gate by using an n-p-n transistor.

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24. How would you construct the basic gates by using either

NOR gate or (ii) NAND gate?

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25. Draw the symbolic diagram of NAND gate and write down its truth table.

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26. What is NOR gate? Prepare its truth table. Why is it called universal gate?

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27. What is an IC? State the advantages of using IC in an electronic circuit.

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28. What are the differences between analogue and digital ICs? State one or two uses of such ICs.

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Higher Order Thinking Skill Hots Questions

1. Convert the number $(120)_3$ into decimal.

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2. Assume that the first and the second digits of any binary system are 7 and 6, respectively. Convert $(76)_{10}$ into this binary system.

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3. What are the differences between analogue circuit and digital circuit?

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4. Given a battery, two switches and an electric bulb, how can (i) an OR gate and (ii) an AND gate be constructed?

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5. Given a battery, a switch and an electric lamp,how can a NOT gate be constructed?

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6. Write down the truth table of the following circuit.

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7. In the Boolean algebra, of the following one which is not equal to A is

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8. In the given circuit diagram [Fig.2.36,], if the output Y= 1, what are the three inputs A,B and C?

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9. An OR gate is operated by using positve logic. What role will the OR gate play if we use negative logic? Or, Show that, the truth table of an OR gate in negative logic is similar to that of an AND gate in positive logic.

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10. How would you construct a NOT gate by using a NOR gate.

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11. The waveforms of two digital signals A and B are shown in Fig. 2.38 . If we apply these two signals A and B to an OR gate as inputs, then what will be the output waveform?

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12. Waveforms of two inputs A and B and output Y are shown in Fig. 2.40. Find Boolean algebraic equation of the associated logic gate and draw the circuit diagram of it.

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13. Write the Boolean expression and the truth table for the logic circuit which is given in Fig. 2.42.

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14. Write the Boolean expression and the truth table for the logic circuit which is shown in Fig. 2.43.

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15. Find the Boolean expression of the given logic circuit in Fig. 2.44. Draw the simplest logic circuit equivalent to this

given logic circuit.

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16. Two digital signals A and B shown in Fig. 2.46 are used as the two inputs of (i) OR (ii) AND (iii) NOR and (iv) NAND gate. Obtain the output waveforms in each of the four cases.

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17. Find the Boolean expression of the given logic circuit in Fig. 2.48. Draw the simplest logic circuit equivalent to this

given circuit.

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18. Find the Boolean experssion from the given truth table and draw its simplest logic circuit.

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19. How would you construct an AND gate by using minimum number of OR and NOT gate.

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20. Find the Boolean expression from the given truth table and draw its simplest logic circuit.

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21. How would you construct an OR gate by using minimum number of AND and NOT gates.

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22. Show that the two circuits, shown in Fig. 2.54(a) and Fig. 2.54(b) are equivalent to each other.

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23. Show that the two circuits shown in Fig. 2.55(a) and Fig.2.55(b) are equivalent to each other.

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24. Two digital signals A and B are represented by two binary numbers 110011 and 100110 respectively. These two signals A and B are applied as inputs of (i) OR (ii) AND (iii) NOR and (iv) NAND gates. Find the binary numbers to represent the outputs in each of the four cases.

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25. Prove the following Boolean relations:

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

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26. Prove the following Boolean relations:

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

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27. Prove the following Boolean relations:

$$ABC + \overline{A}BC + \overline{B}CD = BC + CD$$

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28. Prove the following Boolean relations:

$\overline{A} + AB + \overline{AB} = 1$

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29. Prove the following Boolean relations:

$AB + \overline{B}C + CA = AB + \overline{B}C$

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30. Prove the following Boolean relations:

$\overline{A}BC + A\overline{B}C + AB\overline{C} + ABC = AB + BC + CA$

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31. Prove the following Boolean relations:

$$ABC + \overline{A}BC + A\overline{B}C + \overline{A}\,\overline{B}C + \overline{A}B\overline{C} + \overline{A}\,\overline{B}\,\overline{C} = \overline{A} + C$$

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Ncert Textbook Questions With Answer Hint

1. You are given two circuits as shown in which consist of NAND gates. Identify the logic operations carried out by the two circuits.

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2. You are given two circuits as shown in . Show that the circuit (a) acts as OR gate while the circuit (b) acts as AND gate.

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Exercise

1. The most significant digit of the number 6789 is

A. 6

B. 7

C. 8

D. 9

Answer: A

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2. The most significant digit of the number 0.6789 is

A. 6

B. 7

C. 8

D. 9

Answer: A

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3. The most significant digit of the number 0.6789 is

A. 6

B. 7

C. 8

D. 9

Answer: D

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4. In the Binary number system the number 100 represents

A. one

B. three

C. four

D. hundred

Answer: C

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5. Digital signals

A. represent values as discrete steps

B. do not represent values as discrete steps

C. represent vague steps

D. represent random steps

Answer: A

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6. In Boolean algebra A + B = Y implies that :

A. sum of A and B is Y

B. Y exists when A and B exists or B exists or both A and B exist

C. Y exists only when A and B both exist

D. Y exists when A or B exist but not when both A and B exist

Answer: C

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7. In Boolean algebra A . B = Y implies that:

A. Prodoct of A and B is Y

B. Y exists when A exists or B exists

C. Y exists when both A and B exist but not when only A or B exists

D. Y exists when A or B exists but not both A and B exist

Answer: C

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Ver Short Answer Type Questions

1. Of the two binary numbers, 10010111 and 10011001, which one is the greater?

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2. Of the two numbers $(10)_{10}$ and $(11)_2$ which one is the greater?

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3. What are radix in decimal and binary systems respectively?

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4. $(33)_{10} = (\_\_\_\_\_)_2$ [Fill in the blank]

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5. Is it possible to convert an analogue circuit into a digital circuit?

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6. Is it possible to convert a digital circuit into an analogue circuit?

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7. If A and B are the two inputs of an AND gate, what will be the value of the output?

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8. What role will an AND gate play if negative loagic is used instead of positive logic?

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9. When an input signal 1 is applied to a NOT gate. What will be its output?

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10. If the output of a NOR gate if fed to the input of a NOT gate, then this combination will be called what?

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11. What is the value of 1 + 1 according to Boolean algebra?

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12. If the output of a NOR gate if fed to the input of a NOT gate,name the gate of the combination so formed.

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13. If the output of a NOT gate is used as two inputs of an OR gate, name the gate of the combination so formed.

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14. If the output of a NOT gate is used as two inputs of an AND gate, name the gate of the combination so formed.

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15. How would you construct an AND gate by using more than one NAND gate?

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16. How would you construct a NOT gate by using a NOR gate.

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17. How would you construct an AND gate by using more than one NOR gate?

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18. If the output of an OR gate is used as two inputs of a NAND gate, name the gate of the combination so formed.

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Problem Set I

1. Write down the decimal equivalent of binary numbers.

$(101)_2$,

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2. Write down the decimal equivalent of binary numbers.

$(1011)_2$

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3. Write down the decimal equivalent of binary numbers.

$(10111)_2$

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4. Write down the decimal equivalent of binary numbers.

$(111111)_2$,

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5. Write down the decimal equivalent of binary numbers.

$(0.101)_2$,

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6. Write down the decimal equivalent of binary numbers.

$(110.011)_2$

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7. Write down the decimal equivalent of binary numbers.

$(111.111)_2$

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8. Write down the decimal equivalent of binary numbers.

$(1.1)_2$

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9. Write down the decimal equivalent of binary numbers.

$(1011010)_2$

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10. Write down the decimal equivalent of binary numbers.

$(110011.101)_2$

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11. Write down the binary equivalent of decimal numbers.

$(21)_{10}$

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12. Write down the binary equivalent of decimal numbers.

$(33)_{10}$

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13. Write down the binary equivalent of decimal numbers.

$(75)_{10}$

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14. Write down the binary equivalent of decimal numbers.

$(101)_{10}$

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15. Write down the binary equivalent of decimal numbers.

$(11.375)_{10}$

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16. Prove the following boolean relations :

$A\left(A+\overline{A}\right)+B=A+B$

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17. Prove the following boolean relations :

$(A+B)\left(\overline{A}+B\right)\overline{B}=0$

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Problem Set Ii

1. Addition :

$(110)_2 + (1100)_2 + (11000)_2$

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2. Addition :

$(1.111)_2 + (11.11)_2 + (111.1)_2 + (1111)_2$

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3. Subtraction:

$(110)_2 - (1100)_2$

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4. Subtraction:

$(11.011)_2 - (10.101)_2$

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5. What binary number is to be added with $(11)_2$to get $(1000)_2$?

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6. Prove the following boolean relations.

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

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7. Prove the following boolean relations.

$$(A+B)\left(\overline{A}+C\right)=\overline{A}B+AC$$

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8. Prove the following boolean relations.

$$(A+B)(B+C)=B+CA$$

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9. Prove the following boolean relations.

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

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10. Prove the following boolean relations.

$$\overline{\overline{A} + AB + \overline{A}\overline{B}} = 0$$

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11. Prove the following boolean relations.

$$\overline{AB + BC + CA} = \overline{A}\,\overline{B} + \overline{B}\overline{C} + \overline{C}\,\overline{A}$$

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12. Determine the binary values of the two inputs A and B from the Boolean relation $\left(\overline{A + B}\right) \cdot \overline{AB} = 1$.

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13. Find the binary value of B if $A + \overline{A} + 1 = \overline{B}$.

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14. Determine the binary values of the two inputs A and B from the Boolean relation $\overline{(A + B)} + \overline{AB} = 0$.

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Entrance Corner

1. Statement I: The conversion of binary number 1101 to decimal number can be written as $2^4 + 2^3 + 0 + 2^1 = 26$.

Statement II : In binary system, base is 2 and the digits used are 0 and 1.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: D

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2. Statement I: The conversion of binary fraction 0.101 to decimal fraction can be written as $2^{-1} + 0 + 2^{-3} = 0.625$.

Statement II: In binary system, base is 2 and the digits used are 0 and 1.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: A

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3. Statement I: OR gate is a basic logic gate.

Statement II : Any logic gate can be made by usign more than one OR gate in appropriate combination.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: C

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4. Statement I: NOR gate is a basic logic gate.

Statement II: Any logic gate can be made by using more than one NOR gate in appropriate combination.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: D

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5. Statement I: Boolean algebraic equation of NOT gate is $Y = \overline{A}$.

Statement II: NOT gate is used to invert the state of a digital signal between its two possible states.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: A

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6. Statement I: According to Boolean algebra, $1 + 1 = 1$.

Statement II: The output of an AND gate becomes 'on' only if all the inputs remain in 'on' state.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: B

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7. Stetement I: Decimal value of the binary number 111 is 7.

Therefore, $(0.111)_2 = \left(\frac{7}{2^3}\right)_{10}$.

Statement II: Decimal fraction 0.111 can be written as $\frac{111}{10^3}$.

A. Statement I is true, statement II is true, statement II is a correct explanation for statement I.

B. Satement I is true, statement II is true, statement II is not a correct explanation for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

Answer: A

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Multiple Correct Answer Type

1. In a three-input logic gate, first two inputs are in state 1 and the third is 0. For which of the following gates, does the output become 1?

A. OR gate

B. AND gate

C. NOR gate

D. NAND gate

Answer: A,D

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2. Correct Boolean algebraic equation is

A. $A + 0 = 0$

B. $A + 0 = A$

C. $A + 1 = 1$

D. $A + 1 = A$

Answer: B::C

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3. The product of $(110)_2$ and $(100)_2$ is

A. $(1100)_2$

B. $(11000)_2$

C. $(20)_{10}$

D. $(24)_{10}$

Answer: B::D

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4. If A and B are the two inputs of an NAND gate, then the output will be

A. $\overline{AB}$

B. $\overline{A}.\overline{A}$

C. $\overline{\overline{A}+B}$

D. $\overline{A}+\overline{B}$

Answer: A::D

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5. The outputs of a three-input OR gate and a three-input NAND gate will be same, if

A. all three inputs become 0

B. one input become 1

C. two inputs become 1

D. all three inputs become 1

Answer: B::C

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Examination Archive With Solutions Wbchse

1. Express 39 as a binary number.

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2. Draw the symbol of an AND gate, and write its truth table.

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3. Prepare the truth table of a two-input NAND gate.

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4. What is NOR gate? Prepare its truth table. Why is it called universal gate?

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5. What is the decimal equivalent of the binary number 10011?

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6. Draw the symbol of a two input NOR gate.

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7. What is AND gate? Draw the symbol of AND gate and perpare its truth table.

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8. If two inputs of a NAND gate are joined, what type of a gate is formed?

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9. Write down the value of $\left(\overline{X}+X\right)$ and $\left(X.\overline{X}\right)$ in Boolean algebra.

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10. Form AND gate using NOR gates.

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1. The output Y of logic circuit is given below

A. $\overline{A} + B$

B. $\overline{A}$

C. $\left(\overline{\overline{A} + B}\right) . \overline{A}$

D. $\left(\overline{\overline{A} + B}\right) . A$

Answer:

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2. The inputs to the digital circuit are shown below. The output Y is

A. $A + B + \overline{C}$

B. $(A + B)\overline{C}$

C. $\overline{A}+\overline{B}+\overline{C}$

D. $\overline{A}+\overline{B}+C$

Answer:

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3. In the given circuit, the binary inputs at A and B are both 1 in one case and both 0 in the next case. The respective outputs at Y in these two cases will be

A. 1,1

B. 0,0

C. 0,1

D. 1,0

Answer:

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4. In the circuit shown, inputs A and B are in states 1 and 0 respectively. What is the only possible stable sate of the outputs X and Y?

A. X = 1, Y = 1

B. X = 1, Y = 0

C. X = 0, Y = 1

D. X = 0, Y = 0

Answer:

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1. If a,b,c,d are inpute to a gate and x is its output, then as per the following time graph, the gate is

A. NOT

B. AND

C. OR

D. NAND

Answer:

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1. Which logic gate is represented by the following combination of logic gates?

A. OR

B. NAND

C. AND

D. NOR

Answer:

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Examination Archive With Solutions Neet

1. To get output 1 for the following circuit, the correct choice for the input is

A. A = 1, B = 0, C = 0

B. A = 1, B = 1, C = 0

C. A = 1, B = 0, C = 1

D. A = 0, B = 1, C = 0

Answer:

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2. From the circuit of the following logic gates, the basic logic gate obtained is

A. NAND gate

B. AND gate

C. OR gate

D. NOT gate

Answer:

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3. In the combination of the following gates the output Y can be written in terms of inputs A and B as

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

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

C. $\overline{\overline{A}.\overline{B}}$

D. $\overline{\overline{A} + \overline{B}}$

Answer:

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Cbse Scanner

1. In the circuit shown in the figure, identify the equivalent gate of the circuit and make its truth table.

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2. Identify the gates P and Q shown in the figure. Write the truth table for the combination of the gates shown.

Name the equivalent gate representing this circuit and draw its logic symbol.

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3. The following figure shows the input waveforms (A,B) and the output waveform (Y) of a gate. Indentify the gate. Write its truth table and draw its logic symbol.

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4. The figure shows input waveforms A and B to a logic gate. Draw the output waveform for an OR gate. Write the truth table for this logic and draw its logic symbol.

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5. The figure shows the input waveforms A and B for 'AND' gate. Draw the output waveform and write the truth table for this logic gate.

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6. Give the truth table and circuit symbol for NAND gate.

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