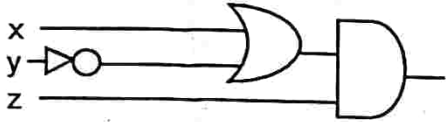


Qn. 24

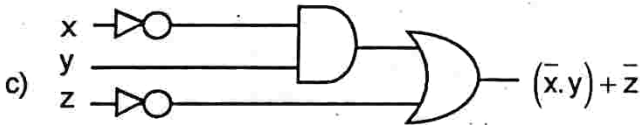
Consider the logical gate diagram.



- a) Find the logical expression for the circuit given.
- b) Find the compliment of the logical expression.
- c) Draw the circuit diagram representing the compliment.

- a) Circuit ന് സമാനമായ logical expression എഴുതുക.
- b) logical expression ന്റെ complement കണ്ടുപിടിക്കുക.
- c) Complement ന് സമാനമായ Logic circuit വരയ്ക്കുക.

ANS a) $(x + \bar{y}) \cdot z$ b) $(\bar{x} \cdot y) + \bar{z}$

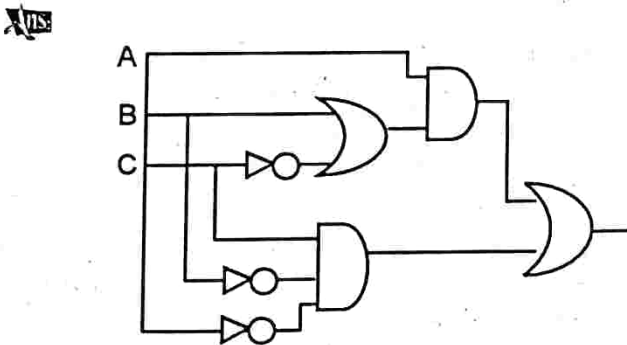


Qn. 25

Draw the logic circuit diagram for the following Boolean expression.

താഴെ തന്നിരിക്കുന്ന expression ന് സമാനമായ circuit വരയ്ക്കുക.

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



Qn. 26

Consider a bulb with three switches x, y and z. Write the Boolean expression representing the following states.

- a) All the switches x, y and z are ON
- b) x is ON and y is OFF or Z is OFF
- c) Exactly one switch is ON.

മൂന്ന് switches, x, y & z ഉള്ള ഒരു ബൾബ് പരിഗണിച്ച് താഴെ കൊടുത്തിരിക്കുന്നവയ്ക്കുള്ള boolean expression എഴുതുക.

- a) എല്ലാ switches ഉം ON ആണ്.
- b) x എന്ന switch ON ആണ്. Y സ്വിച്ചോ Z സ്വിച്ചോ, OFF ആണ്.
- c) ഒരേ ഒരു സ്വിച്ച് മാത്രം ON ആണ്.

ANS a) $x \cdot y \cdot z$ b) $x \cdot \bar{y} + \bar{z}$ c) $x \cdot \bar{y} \cdot \bar{z} + \bar{x} \cdot y \cdot \bar{z} + \bar{x} \cdot \bar{y} \cdot z$

Qn. 27

Match the following.

ചേരുംപടി ചേർക്കുക.

- | | |
|---|---|
| <p>A</p> <ul style="list-style-type: none"> i) Idem potent law ii) Involution law iii) Complementarity law iv) Commutative law v) Absorption law vi) Associative law | <p>B</p> <ul style="list-style-type: none"> a) $x + (y + z) = (x + y) + z$ b) $x + xy = x$ c) $x + y = y + x$ d) $\bar{\bar{x}} = x$ e) $x = x$ f) $x + x = x$ |
|---|---|

ANS i - f, ii - e, iii - d, iv - c, v - b, vi - a

Qn. 28

Explain the principle of duality.

എന്താണ് Principle of Duality?

ANS It states that, starting with a Boolean relation, another Boolean relation can be derived by

- i) Changing each OR sign (+) to a AND sign (.)
- ii) Changing each AND sign (.) to an OR sign (+)
- iii) Replacing each 0 by 1 and each 1 by 0.

The relation derived using the duality principle is called the dual of the original expression. eg: $x + 0 = x$ is the dual of $x \cdot 1 = x$

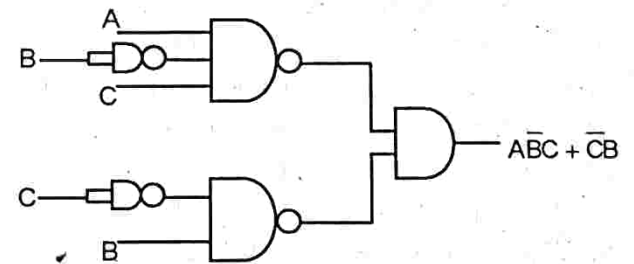
Qn. 29

Draw the circuit diagram for

$F = \overline{ABC} + \overline{CB}$ using NAND gate only.

NAND gates മാത്രം ഉപയോഗിച്ച് circuit വരയ്ക്കുക.

ANS $F = \overline{ABC} + \overline{CB}$
 $= (A \text{ NAND } (\text{NOT } B) \text{ NAND } C) \text{ NAND } ((\text{NOT } C) \text{ NAND } B)$

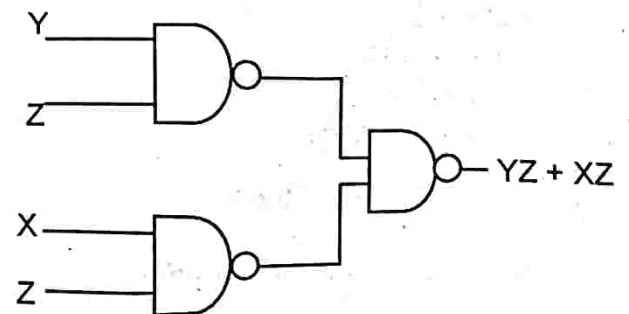


Qn. 30

Draw a logic diagram for the function $f = YZ + XZ$ using NAND gates only.

NAND gate മാത്രം ഉപയോഗിച്ച് വരയ്ക്കുക.

ANS $f = YZ + XZ$
 $= (Y \text{ NAND } Z) \text{ NAND } (X \text{ NAND } Z)$

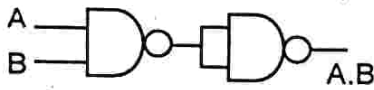


Qn. 31

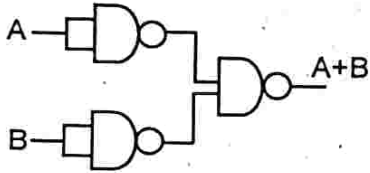
How do you make various basic logic gates using NAND gates.

NAND gates ഉപയോഗിച്ച് എങ്ങനെ basic gates ഉണ്ടാക്കാം?

Ans i) AND operation using NAND gate,
 $A.B = (A \text{ NAND } B) \text{ NAND } (A \text{ NAND } B)$



ii) OR operation using NAND gate,
 $A+B = (A \text{ NAND } A) \text{ NAND } (B \text{ NAND } B)$



iii) NOT operation using NAND gate,
 $\text{NOT } A = (A \text{ NAND } A)$



Qn. 32

Which of the following Boolean expressions are correct? Write the correct forms of the incorrect ones. താഴെ തന്നിരിക്കുന്നവയിൽ നിന്ന് ശരിയായത് എടുത്തെഴുതുക. ശരിയല്ലാത്തത് തെറ്റുതിരുത്തുക.

- a) $A + A^1 = 1$
- b) $A + 0 = A$
- c) $A.1 = A$
- d) $A.A^1 = 1$
- e) $A + A.B = A$
- f) $A.(A+B) = A$
- g) $A + 1 = 1$
- h) $\overline{(A.B)} = \overline{A}. \overline{B}$
- i) $A + A^1.B = A + B$
- j) $A + A = A$
- k) $A + B.C = (A+B).(B+C)$

- Ans** a) Correct
- b) Correct
- c) Correct
- d) Wrong, $A.A^1 = 0$
- e) Correct
- f) Correct
- g) Correct
- h) Wrong $\overline{A.B} = \overline{A} + \overline{B}$
- i) Correct
- j) Correct
- k) Wrong, $A+B.C = (A+B).(A+C)$

Qn. 33

Prove algebraically that $\overline{(x+y)}.(\overline{x+y}) = \overline{x}. \overline{y}$

Algebra ഉപയോഗിച്ച് തെളിയിക്കുക.

Ans LHS = $(x+y)^1.(x^1+y^1)$
 $= (x^1.y^1).(x^1.y^1)$
 $= x^1.y^1.x^1 + x^1.y^1.y^1$
 $= x^1.y^1 + x^1.y^1$
 $= x^1.y^1 = \text{RHS}$

Hence proved.

Qn. 34

Give the complement of the following Boolean Expression.

- i) $(A+B).(C+D)$
- ii) $(P+Q) + (Q+R).(R+P)$
- iii) $(B+D^1).(A+C^1)$

Ans i) $\overline{(A+B).(C+D)^1} = (A+B)^1 + (C+D)^1$
 $= A^1.B^1 + C^1.D^1$

ii) $\overline{((P+Q) + (Q+R).(R+P))^1} = (P+Q)^1 + ((Q+R).(R+P))^1$
 $= P^1.Q^1 + (Q+R)^1 + (R+P)^1$
 $= P^1.Q^1 + (Q^1.R^1 + R^1.P^1)$

iii) $\overline{(B+D^1).(A+C^1)^1} = (B+D^1)^1 + (A+C^1)^1$
 $= B^1.D^{11} + A^1.C^{11}$
 $= B^1.D + A^1.C$

Qn. 35

State and prove the idempotent law using truth table. Idempotent law പ്രസ്താവിച്ച് truth table ഉപയോഗിച്ച് തെളിയിക്കുക.

Ans Idempotent law states that

- i) $A+A = A$ and
- ii) $A.A = A$

Proof i) $A + A = A$

Truth table is as follows:

A	A	A+A
0	0	0
1	1	1

ie. $A+A = A$ as it is true for both values of A. Hence proved.

ii) $A.A = A$

Truth table is as follows:

A	A	A.A
0	0	0
1	1	1

ie. $A.A = A$ itself. It is true for both values of A. Hence proved.

Qn. 36

State the Absorption laws of Boolean algebra with the help of truth tables.

Truth table ഉപയോഗിച്ച് Absorption law പ്രസ്താവിക്കുക.

Ans Absorption law states that

$A + A.B = A$ and $A.(A+B) = A$

Proof:

The Truth table of the expression $A+A.B=A$ is as follows.

A	B	A.B	A+A.B
0	0	0	0
0	1	0	0
1	0	0	1
1	1	1	1

Here both columns A and A+A.B are identical. Hence proved.

For $A.(A+B) = A$, the truth table is as follows:

A	B	A+B	A.(A+B)
0	0	0	0
0	1	0	0
1	0	0	1
1	1	1	1

Both columns A & A.(A+B) are identical. Hence proved.

Qn. 37

State Demorgan's laws. Prove any one with truth table method.

Demorgan's law പ്രസ്താവിച്ച് truth table ഉപയോഗിച്ച് തെളിയിക്കുക.

Demorgan's first theorem states that

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

ie. the complement of sum of two variables equals product of their complements.

The second theorem states that

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

ie. The complement of the product of two variables equals the sum of the complement of that variables.

Proof:

Truth table of first one is as follows:

A	B	A+B	(A+B)'	A'	B'	A'.B'
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

From the truth table the columns of both (A+B)' and A'.B' are identical. Hence proved.

Qn. 38

(MARCH - 2015)

Fill in the blanks :

വിട്ടുപോയവ പൂരിപ്പിക്കുക.

a) $(0.625)_{10} = (\dots\dots\dots)_2$

b) $(380)_{10} = (\dots\dots\dots)_{16}$

c) $(437)_8 = (\dots\dots\dots)_2$ (3)

Ans a) $(0.101)_2$

b) $(17C)_{16}$

c) $(100\ 011\ 111)_2$

Qn. 39

(MARCH - 2015)

What do you mean by universal gates? Which gates are called Universal gates? Draw their symbols.

യൂണിവേഴ്സൽ ഗേറ്റുകൾ എന്നാൽ എന്താണ്? ഏതെല്ലാം ഗേറ്റുകൾ ഉണ്ട് യൂണിവേഴ്സൽ ഗേറ്റുകൾ എന്ന് അറിയപ്പെടുന്നത്? അവയുടെ ചിത്രങ്ങൾ വരയ്ക്കുക. (3)

OR

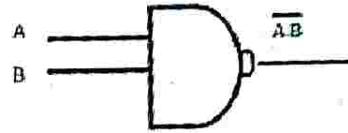
Construct a logical circuit for the Boolean expression $\bar{a} . b + a . \bar{b}$. Also write the truth table.

$\bar{a} . b + a . \bar{b}$. എന്ന ബുളിയൻ എക്സ്പ്രഷന്റെ ലോജിക് സർക്യൂട്ട് വരയ്ക്കുക. ഇതിന്റെ ട്രൂത്ത് ടേബിളും എഴുതുക.

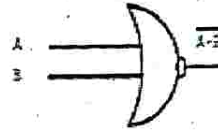
Ans Universal gates

By using NAND and NOR gates only we can create other gate hence these gates are called Universal gate.

NAND gate



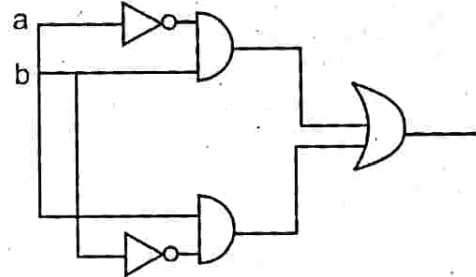
NOR gate



b) Truth Table

a	b	a'	b'	a'.b	a.b'	a'.b + a.b'
0	0	1	1	0	0	0
0	1	1	0	1	0	1
1	0	0	1	0	1	1
1	1	0	0	0	0	0

Logical Circuit



Qn. 40

(SAY - 2015 (IMP)

Computers uses a fixed number of bits to represent data which could be a number, a character, image, sound, video etc. Explain the various methods used to represent characters in memory.

അക്ഷരങ്ങൾ, നമ്പർ, ശബ്ദം, വിവിധ തുടങ്ങിയ ഡാറ്റയെ സൂചിപ്പിക്കാൻ കമ്പ്യൂട്ടറിൽ ഉപയോഗിക്കുന്നത് ഒരു നിശ്ചിത എണ്ണം ബിറ്റുകളാണ്. മെമ്മറിയിൽ ക്യാരക്ടറുകളെ സൂചിപ്പിക്കാൻ ഏതെല്ലാം രീതികൾ ഉപയോഗിക്കുന്നു എന്ന് വിവരിക്കുക.

Ans Representation of characters.

a) ASCII(American Standard Code for Information Interchange) : It is 7 bits code used to represent alphanumeric and some special characters in computer memory. It is introduced by U.S. government. Each character in the key board has a unique number. Eg: ASCII code of 'a' is 97, when you press 'a' in the key board , a signal equivalent to 1100001(Binary equivalent of 97 is 1100001) is passed to the computer memory. $2^7 = 128$, hence we can represent only 128 characters by using ASCII. It is not enough to represent all the characters of a standard keyboard.

OR

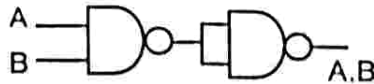
b) L.H.S. = $y.z + y.z + y.z + y$
 = $y.(z+z) + y.(z+1)$
 = $y.1 + y.1 = y.y = 1$

Qn. 45 (SAY - 2016)

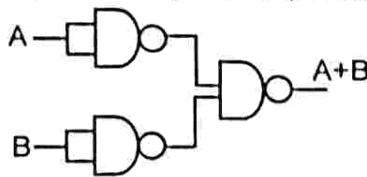
With the help of a neat circuit diagram, prove that NAND gate is a universal gate.

വ്യക്തിയായ സർക്യൂട്ട് വായുഗ്രന്ഥിന്റെ സഹായത്തോടെ നാൻഡ് ഗേറ്റ് ഒരു യൂണിവേഴ്സൽ ഗേറ്റ് ആണ് എന്ന് തെളിയിക്കുക. (3)

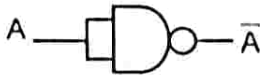
i) AND operation using NAND gate,
 $A.B = (A \text{ NAND } B) \text{ NAND } (A \text{ NAND } B)$



ii) OR operation using NAND gate,
 $A+B = (A \text{ NAND } A) \text{ NAND } (B \text{ NAND } B)$



iii) NOT operation using NAND gate,
 $\text{NOT } A = (A \text{ NAND } A)$



Qn. 46 (MARCH - 2017)

Boolean expression:

Boolean എക്സ്പ്രഷന്റെ ലോജിക് സർക്യൂട്ട് വരയ്ക്കുക.

$(A + \overline{BC}) + \overline{AB}$ (3)

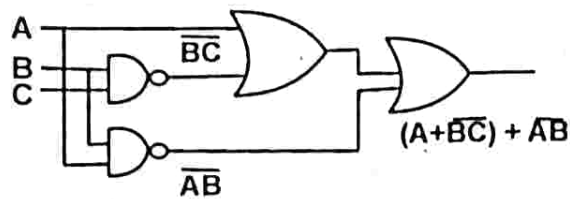
OR

Using algebraic method, prove that

ആൾജിബ്രായിക് രീതിയിൽ തെളിയിക്കുക.

$\overline{Y}.Z + \overline{Y}.Z + Y.Z + Y = 1$ (3)

Ans



OR

$\overline{Y}.Z + \overline{Y}.Z + Y.Z + Y$
 = $\overline{Y}.(Z+Z) + Y.(Z+1)$
 = $\overline{Y}.1 + Y.1$
 = $\overline{Y} + Y$
 = 1

Hence the result.

5 MARK QUESTIONS & ANSWERS

Qn. 1 Explain the components of Data processing.
 ഡാറ്റാ പ്രോസസ്സിങ്ങിന്റെ components വിവരിക്കുക.

Ans Data processing consists of the techniques of sorting, relating, interpreting and computing items of data in order to convert meaningful information. The components of data processing are given below.

- a) Capturing data- In this step acquire or collect data from the user to input into the computer.
- b) Input- It is the next step. In this step appropriate data is extracted and feed into the computer.
- c) Storage- The data entered into the computer must be stored before starting the processing.
- d) Processing / Manipulating data- It is a laborious work. It consists of various steps like computations, classification, comparison, summarization, etc. that converts input into output.
- e) Output of information- In this stage we will get the results as information after processing the data.
- f) Distribution of information- In this phase the information(result) will be given to the concerned persons / computers.

Qn. 2

Define computer. What are the characteristics? Computer എന്നാലൊരാൾ? അതിന്റെ characteristics വിശദീകരിക്കുക.

Ans A computer is an electronic device used to perform operations at very high speed and accuracy.

Following are the characteristics of the computer.

- 1) Speed - It can perform operations at a high speed.
- 2) Accuracy - It produces result at a high degree of accuracy.
- 3) Diligence: Unlike human beings, a computer is free from monotony, tiredness, lack of concentration etc. We know that it is an electronic machine. Hence it can work four hours without making any errors.
- 4) Versatility: It is capable of performing many tasks. It is useful in many fields.
- 5) Power of Remembering: A computer consists of huge amount of memory. So it can store and recall any amount of information. Unlike human beings it can store huge amount of data and can be retrieved when needed.

Disadvantages of computer

- 1) No. IQ : It has no intelligent quotient. Hence they are slaves and human beings are the masters. It can't take its own decisions.
- 2) No feelings: Since they are machines they have no feelings and instincts. They can perform tasks based upon the instructions given by the humans (programmers)