19. Briefly write the major changes in the technology during the different generations of computers.

Ans. **[March 2015, Score 2]**

Criteria	Generations				
	First	**Second**	**Third**	**Fourth**	**Fifth**
Technology	Vacuum Tube	Transistor	IC chip	Microprocessor	AI
Language	Machine	Assembly	High Level	High Level	High Level
Period	1940-196	1956-1963	1964-1971	1971-Present	Present and Future

****

Chapter – 2 – Data Representation and Boolean Algebra

1. $1011)_2 = (\ldots\ldots\ldots\ldots)_{10}$ **[March 2020, Score 1]**

Ans. $(11)_{10}$

2. State De Morgan's theorems. **[March 2020, Score 2]**

Ans. De Morgan's theorems are:

i) $\overline{X + Y} = \overline{X} \cdot \overline{Y}$ (The complement of sum of Boolean variables is equal to product of their individual complements.)

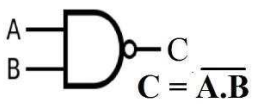
ii) $\overline{X \cdot Y} = \overline{X} + \overline{Y}$ (The complement of product of Boolean variables is equal to sum of their individual complements.)

3. What are universal gates in Boolean algebra? Draw its symbols with truth tables.

[March 2020, Score 3]

Ans. NAND and NOR gates are the universal gates in Boolean algebra

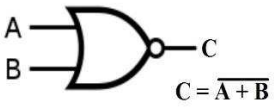
NAND GATE



Truth Table

INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

NOR GATE



TRUTH TABLE

INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

4. Do the following number conversion : **[March 2020, Score 3]**

(a) $(34)_8$ to decimal

(b) $(234)_{10}$ to binary

(c) $(1234)_{10}$ to Hexadecimal

Ans. $(34)_8 = (28)_{10}$

(b) $(234)_{10} = (11101010)_2$

(c) $(1234)_{10} = (4D2)_{16}$

5. Each digit of a binary number is called ---------- **[July 2019, Score 1]**

Ans. Bit

6. If $(x)_8 = (101011)_2 = (y)_{16}$ Find the values of x and y **[July 2019 , Score 2]**

Ans. x = 53

y = 2B

7. Explain about any three number systems. **[July 2019, Score 3]**

Ans. Decimal Number System: Decimal number system is a base 10 number system having 10 digits from 0 to 9. This means that any numerical quantity can be represented using these 10 digits.

Binary Number System:. The number system having just these two digits – 0 and 1 – is called binary number system. Its base is 2.

Octal Number System: Octal number system has eight digits – 0, 1, 2, 3, 4, 5, 6 and 7. Octal number system is also a positional value system with where each digit has its value expressed in powers of 8.

8. Write notes on : **[July 2019, Score 3]**

(a) ASCII

(b) Sign Magnitude

(c) Unicode

Ans. a) ASCII is a popular character encoding system. This code is used in data Communication. It is a 7-bit code. ASCII is of two types ASCII -7 and ASCII -8. Using ASCII – 7, 128 unique combinations or representations and by ASCII – 8 , 256 combinations are possible.

b) Sign magnitude is a type of integer representation method. In this, leftmost bit (sign bit) in the number represents sign of the number. The sign bit is 0 for positive numbers and 1 for negative numbers.

c) Unicode is a universal character encoding standard for representing text in any written language. It uses 16 bits. Nowadays Unicode uses more than 16 bits. Unicode has the following advantages

9. The number of symbols used in a number system is ---------- **[March 2019, Score 1]**

Ans. Base

10. State De-Morgan's theorems. **[March 2019, Score 2]**

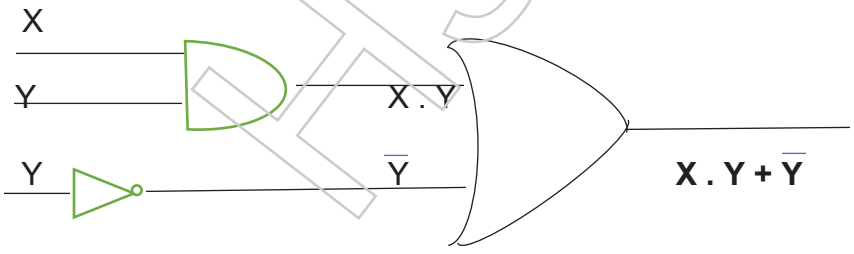
Ans. De Morgan's theorems are:

i) $\overline{X + Y} = \overline{X} \cdot \overline{Y}$ (The complement of sum of Boolean variables is equal to product of their individual complements.)

$\overline{X \cdot Y} = \overline{X} + \overline{Y}$ (The complement of product of Boolean variables is equal to sum of their individual complements.)

11. Draw the logic circuit for Boolean expression $X.Y + \overline{Y}$ **[March 2019, Score 3]**

Ans.



12. Convert $(11011)_2$ to Octal decimal and Hexadecimal number systems. **[March 2019, Score 3]**

Ans. $(11011)_2$ = 011 011

$= (3\ 3)_8$

13. Draw the truth table of NAND gate. **[July 2018, Score 2]**

Ans. The truth table of NAND gate is:

Input		Output
A	B	Y= $\overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

14. Fill in the blanks **[July 2018, Score 3]**

a) (.....) $_{10}$ = (11001) $_2$

b) (.625) $_{10}$ = (.....) $_2$

c) (AB) $_{16}$ = (.....) $_2$

Ans. a) (25) $_{10}$

b) (0.101) $_2$

c) (1010 1011) $_2$

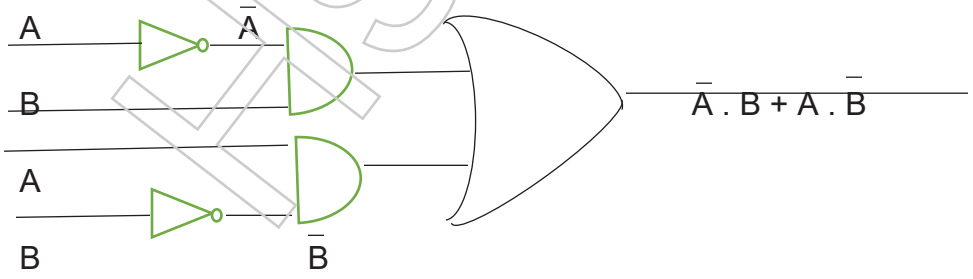
15. a) MIDI stands for---------- **[July 2018, Score 1]**

b) Draw the logic circuit for the Boolean expression **[Score 2]**

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

Ans. a) Musical Instrument Digital Interface

b)



16. a) Number of symbols in a number system is called …….. **[March 2018, Score 3]**

b) Find MSD in the decimal number 7854.25.

c) Find octal equivalent of $(400)_{10}$

Ans. a) MSD is 7

b)

8 |	400	
8 |	5 0	0
8 |	6	2
	0	6

$(400)_{10} = (620)_8$

17. a) ASCII stands for ..... **[March 2018, Score 3]**

b) Find the largest number in the list.

i) $(10000)_2$ ii) $(1000)_8$ iii) $(100)_{10}$ iv) $(10)_{16}$

Ans. a) American Standard Code for Information Interchange

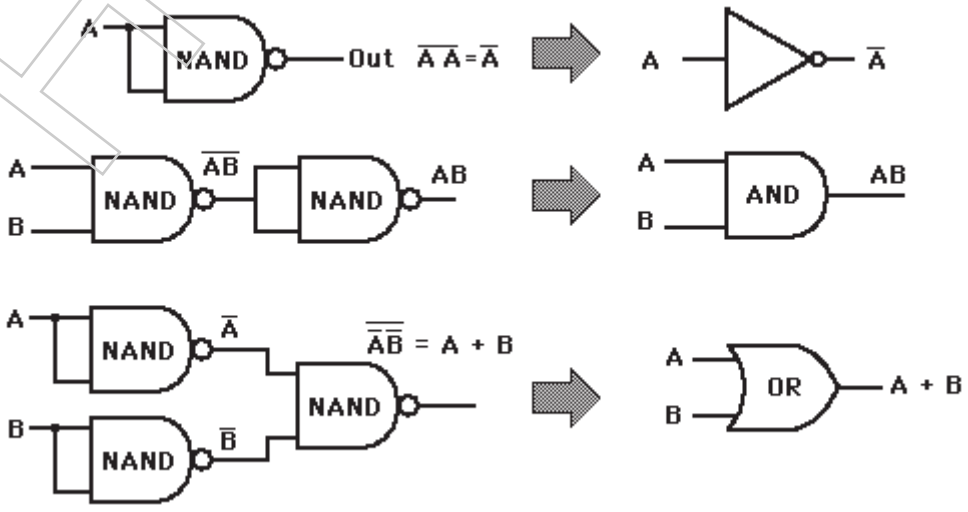
b) i) $(10000)_2 = (16)_{10}$ ii) $(1000)_8 = (512)_{10}$

iii) $(100)_{10}$ iv) $(10)_{16} = (16)_{10}$

So, Largest number is : $(1000)_8$

18. NAND gate is known as universal gate because it can be connected to other NAND gates to generate any logic function. Show how will you connect NAND gates to produce OR gate, AND gate and inverter. **[July 2017, Score 3]**

Ans. The Universal Property of NAND gate is:



19. Represent the following integers in sign-magnitude form, 1's complement form and 2's complement form by using eight bits. **[July 2017, Score 3]**

a) +25.

b) -30 **OR**

20. Briefly explain any three methods of representing characters in computer memory.

[July 2017, Score 3]

Ans.

a) sign and magnitude form of +25 =00011001
   1's Complement of +25= 00011001
   2's complement of +25=00011001
b) sign and magnitude form of -30 =10011110
   1's Complement of -30= 11100001
   2's complement of -30=11100010

OR

Three methods for representing characters in computer memory are:

1: ASCII – American Standard Code for Information Interchange – 7 bit or 8 bit to represent a character in memory

2. EBCDIC – Extended Binary Coded Binary Coded Decimal Interchange Code. It is a 8 bit code and can encode 256 characters

3.ISCII – Indian Standard Code for Information Interchange. It uses 8 bit for character representation. Now replaced by Unicode.

21. Convert the hexadecimal number $(A\ 2\ D)_{16}$ into its octal equivalent

Ans. $(A2D)_{16}$ = A 2 D

1010 0010 1101

$= (101000101101)_2$

$(101000101101)_2$ = 101 000 101 101

22.The number $(158)_{10}$ can be represented in hexadecimal system is ----------

[March 2017, Score 1]

Ans.

16	158	
16	9	14
	0	9

$(158)_{10} = (9 E)_{16}$

23. Represent -38 in 2's Complement form. **[March 2017, Score 2]**

Ans.

2	38	
2	19	0
2	9	1
2	4	1
2	2	0
	1	0

Binary of 38 in 8-bit form = $(00100110)_2$

-38 in 2's complement form=11011001 +

1

$(11011010)_2$

24. Draw a logic circuit for the following expression: **[March 2017, Score 3]**

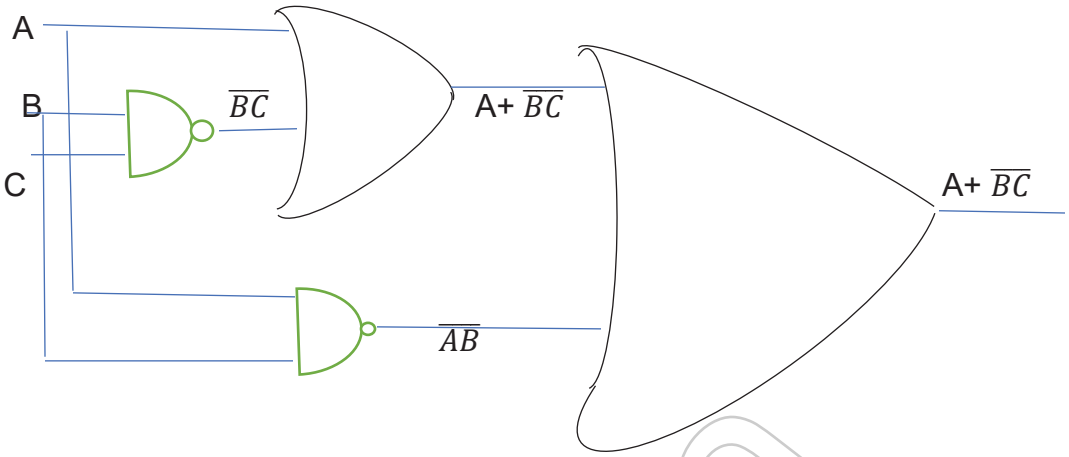
$(A + \overline{BC}) + \overline{AB}$

OR

Using algebraic method, prove that $\bar{Y} . \bar{Z} + \bar{Y} . Z = Y . Z + Y = 1$

Ans.

.



OR

LHS: $\bar{Y}.\bar{z} + \bar{y}.z = \bar{Y}.(\bar{z} + z)$, distributive Law

$= \bar{Y}.1$, Complementary Law

$= 1$, Identity Law

RHS: $Y.Z + Y = Y.(Z+1)$, distributive Law

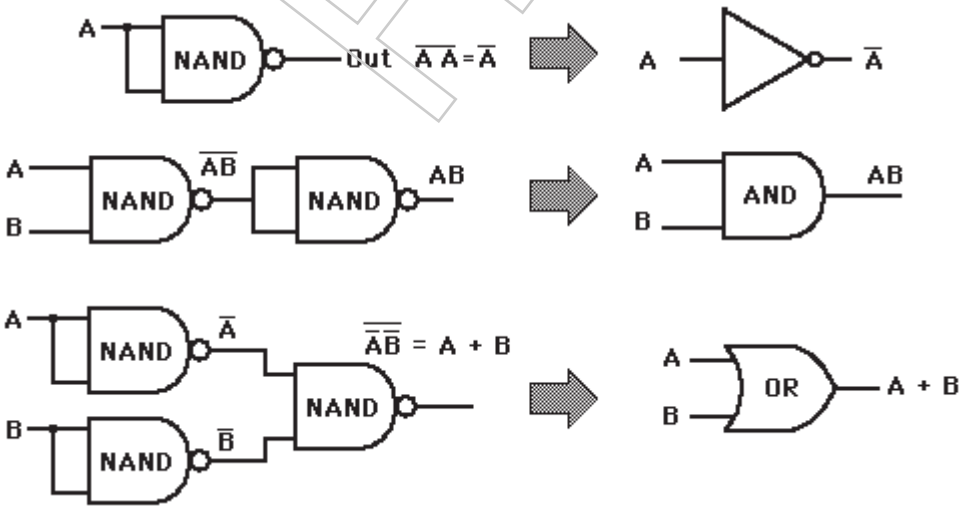
$= Y.1$, Identitty Law

$= 1$, Identity Law

Hence LHS=RHS

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

Ans. **[July 2016, Score 3]**



26. Perform the following number conversions. **[July 2016, Score 2]**

a) (110111011.11011) $_2$ = (…….) $_8$

b) (128.25) $_{10}$ = (…….) $_8$

Ans. a) (110111011. 11011)$_{2=}$(110 111 011 . 110 110)=(673.66)$_8$

b)

8 | 128		.25*
8 | 16	0	8
8 | 2	0	2.00
0	2	

(128.25)$_{10}$ =(200.2)$_8$

27. 1's complement of the binary number 110111 is … (Hint: Use 8 bit form)**[March 2016, Score 1]**

Ans. 11001000

28. Express the integer number -39 in sign and magnitude representation

[March 2016, Score 2]

Ans. Binary equivalent of -39 = 10 0111

-39 in 8 bit form = 0010 0111

Sign and magnitude representation of -39 = 10100111

29. Following are the numbers in various systems. Two of the numbers are same. Identify them.

a) (310) $_8$ b) (1010010) $_2$ c) (C8) $_{16}$ d) (201) $_{10}$ **[March 2016, Score 3]**

OR

Consider the following Boolean expression:

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

Identify the law behind the above expression and prove it using algebraic method.

Ans. a) (310) $_8$ and (C 8) $_{16}$

b) L.H.S. = (B' + A) '

= (B') ' . A ' (De - Morgan's Law)

= B. A’ (Involution Law)

= R.H.S.

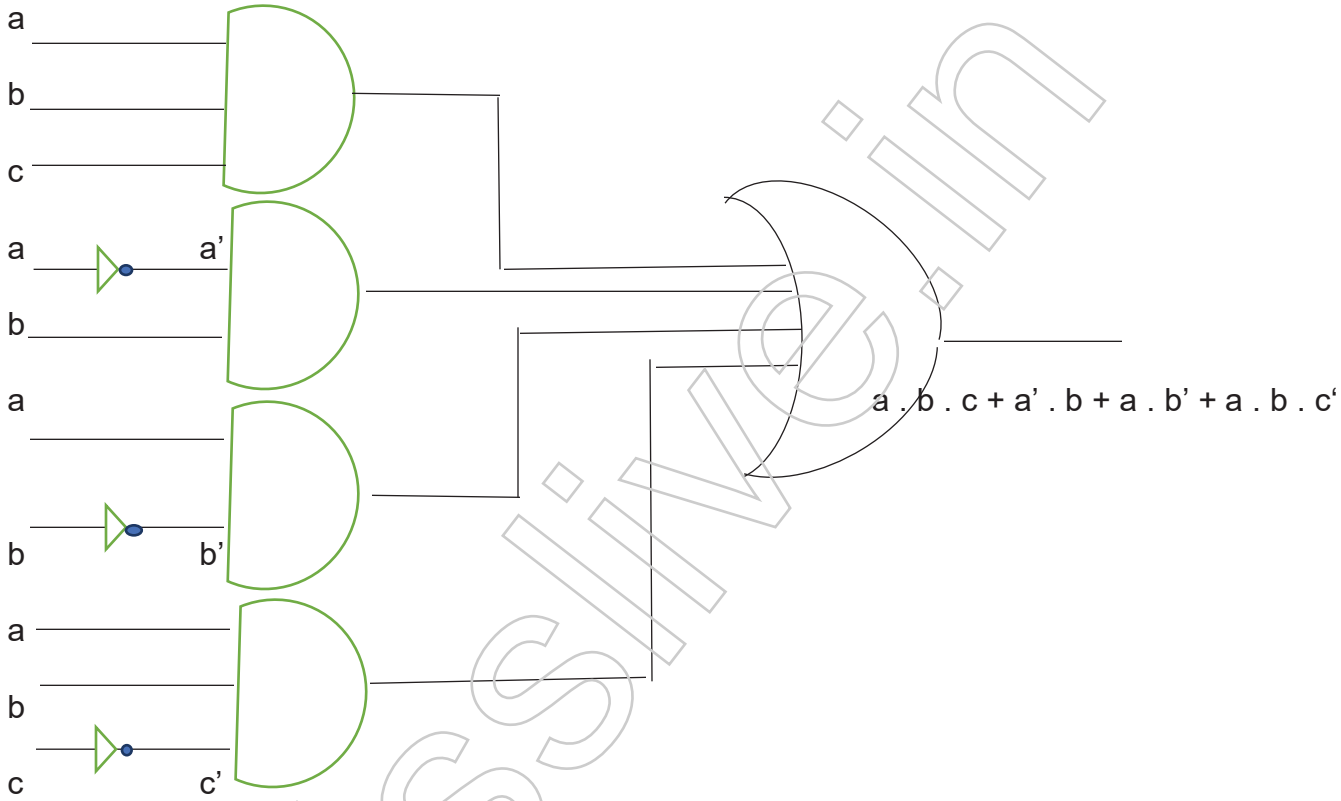
30. Draw the logic circuit for the function.

f (a, b, c) = a . b . c + a’ . b + a . b’ + a . b . c‘ **[July 2015, Score 3]**

OR

Prove algebraically x . (y . z) = x . y + x . z

Ans.



OR

Error in question.

31. Fill in the blanks **[March 2015, Score 3]**

a) (0.625) $_{10}$ = (…….) $_{2}$

b) (380) $_{10}$ = (……) $_{2}$

c) (437) $_{10}$ = (……..) $_{2}$

Ans.

a) (0.101) $_{2}$

b) (101111100) $_{2}$

c) (110110101) $_2$

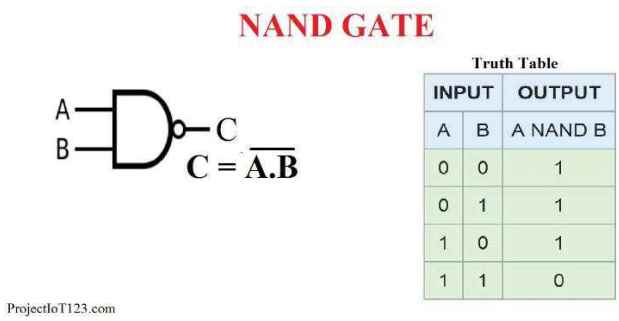
32. What do you mean by universal gates ? Which gates are called as universal gates ? draw their symbols.

OR **[March 2015, Score 3]**

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

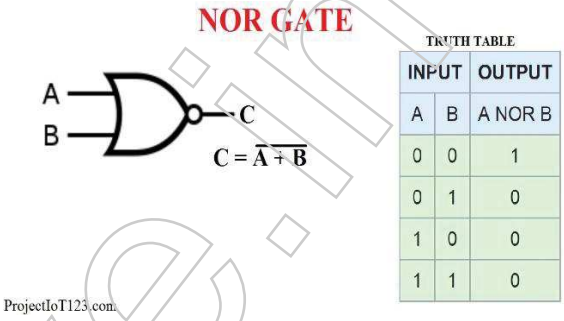
Ans. An universal gate is a gate which can implement any Boolean function without using any

Other gate type. NAND and NOR gates are called universal gates.



Truth Table

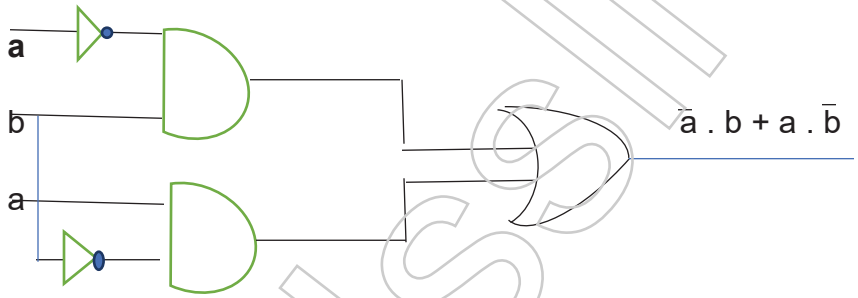
INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0



TRUTH TABLE

INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

OR



Truth Table

a	b	a'b	ab'	a'b+ab'
0	0	0	0	0
0	1	1	0	1
1	0	0	1	1
1	1	0	0	0

****