MODEL TEST PAPER
SUBJECT CODE - 201
BRANCH - EE
2017-18

Ques 1: What are the advantages of digital system over analog system?

Ans. 1: Advantages of digital over analog system are following:

(a) Digital devices work only in two states (i.e. ON or OFF or '0' and '1'). Thus, their operation is very simple and reliable.

(b) Ease of programmability: Digital systems can be used for different applications by simply changing the program (software) without additional changes in hardware.

(c) Reduction in cost of hardware: Cost of hardware gets reduced by use of digital components and this is possible due to advances in IC technology. Digital ICs are very cheap and compact in size. Variety of digital ICs are available.

(d) High Reliability: Digital systems are highly reliable and one of the reasons responsible for it is the use of error correction codes.

(e) Design is easy: Design of digital systems which require use of Boolean Algebra and other digital techniques is easier compared to analog designing.

(f) Results can be reproduced easily: Since the output of digital systems unlike analog systems is independent of temperature, noise, humidity and other characteristics of components, therefore, the reproducibility of results is higher in digital systems than in analog systems.

g) Power requirement of digital circuits is very low.

h) Digital systems have the characteristic advantage of memory. ∴ information can be stored over a period of time. Space required for this storage is very small.

i) Digital systems have high fidelity and provide noise-free operations.

Ques. 2 (a) Draw the symbol and truth table of Universal logic gates and also explain why do we call them Universal logic gates?

Ans. 2(a) There are two (2) Universal logic gates.
(i) NAND gate
(ii) NOR gate

(i) NAND gate:

A NAND gate is a combination of AND gate and a NOT gate (inverter). It has two or more input signals but only one output signal. All the input signals must be high to get a low output.

Symbol

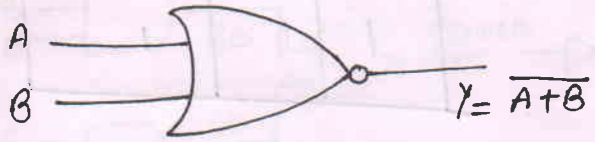
TRUTH TABLE:

A	B	$Y = \overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

(ii) NOR gate:

A NOR gate is a combination of OR gate and NOT gate. It has two or more input signals but only one output signal. All inputs must be low to get a high output.

Symbol:



TRUTH TABLE:

A	B	$Y = \overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

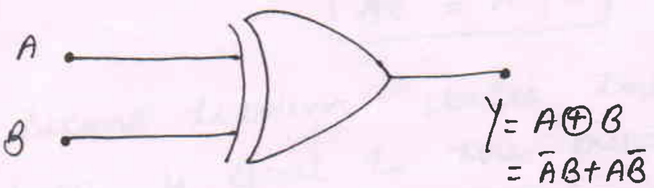
The NAND gate and the NOR gate are called as Universal logic gates since combinations of them can be used to accomplish any of the basic operations and thus can produce an inverter, an OR gate or an AND gate.

Ques. 2 (b) Draw the symbol and make the truth table of the following gates:

(i) EX-OR gate

(ii) EX-NOR gate.

Ans. 2(b) (i) EX-OR gate

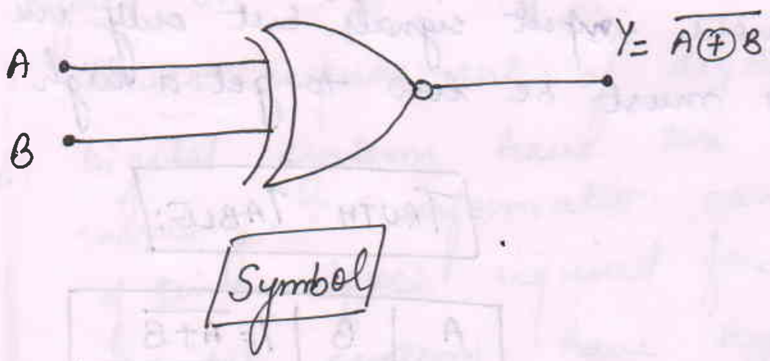


Symbol

TRUTH TABLE

I/Ps		O/P
A	B	$Y = A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

(ii) EX-NOR gate



TRUTH TABLE

I/ps		O/p
A	B	$Y = \overline{A \oplus B}$
0	0	1
0	1	0
1	0	0
1	1	1

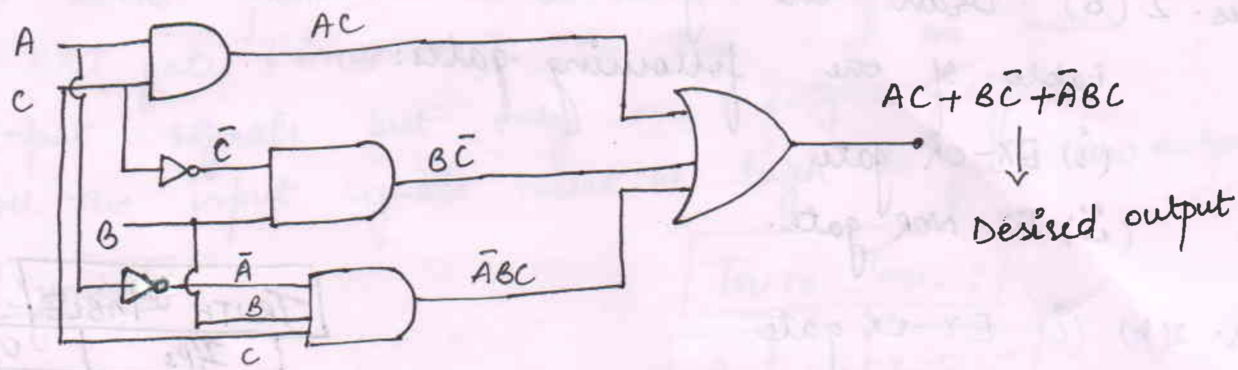
Ques. 3 Realise the following expressions using basic logic gates.

(i) $AC + B\overline{C} + \overline{A}BC$

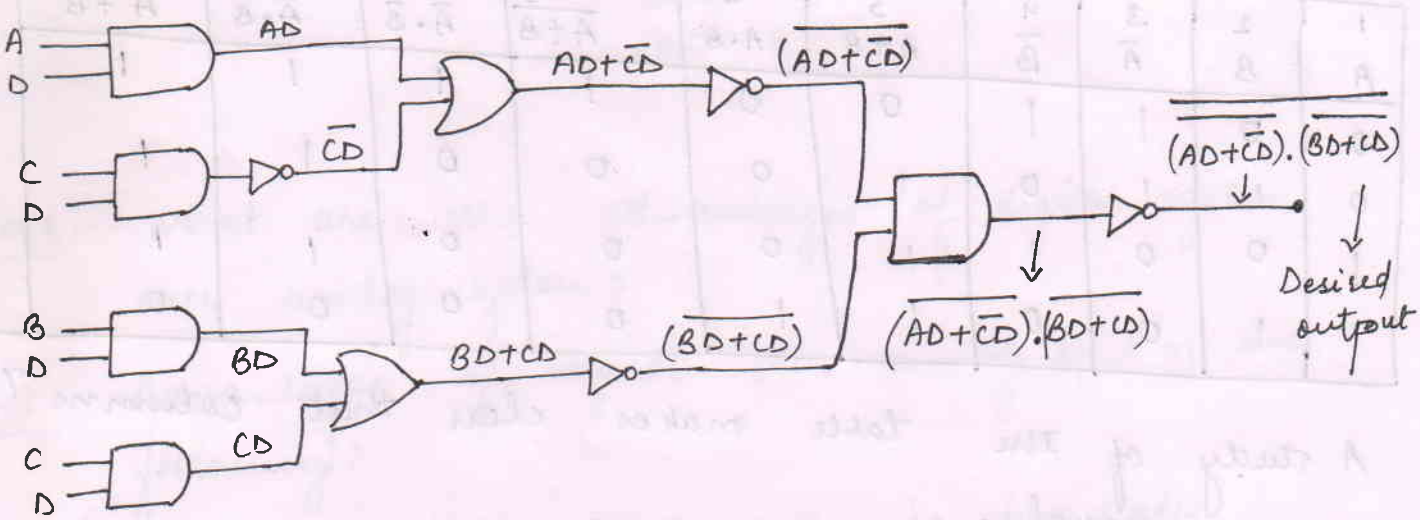
(ii) $\overline{(AD+\overline{C}D)\cdot(\overline{BD+C\overline{D}})}$

(iii) $\overline{(\overline{A}+\overline{A+B})\cdot(\overline{B}+\overline{B+C})}$

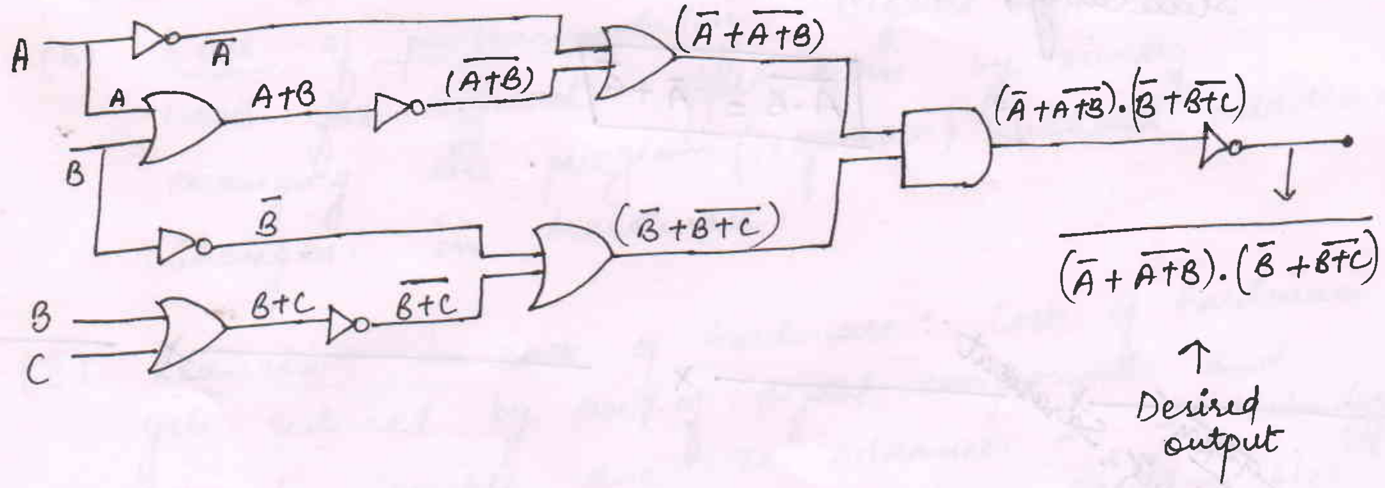
Ans. 3 (i) $AC + B\overline{C} + \overline{A}BC$



(ii) $\overline{(AD+\overline{CD}).(\overline{BD+CD})}$



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



Ques. 4 State and prove De-Morgan's theorem.

Ans. 4 First theorem states that the complement of a product is equal to the sum of the complements. That is, if the variables are A and B, then

$$\boxed{\overline{AB} = \bar{A} + \bar{B}}$$

Second theorem states that, the complement of a sum is equal to the product of the complements.

$$\boxed{\overline{A+B} = \bar{A}.\bar{B}}$$

De Morgan's theorem proof by perfect induction method.

1 A	2 B	3 $\bar{A}$	4 $\bar{B}$	5 $A+B$	6 $A \cdot B$	7 $\overline{A+B}$	8 $\bar{A} \cdot \bar{B}$	9 $\overline{A \cdot B}$	10 $\bar{A}+\bar{B}$
0	0	1	1	0	0	1	1	1	1
0	1	1	0	1	0	0	0	1	1
1	0	0	1	1	0	0	0	1	1
1	1	0	0	1	1	0	0	0	0

A study of the table makes clear that columns 7 and 8 are equal.

$\therefore$ $\overline{A+B} = \bar{A} \cdot \bar{B}$

Similarly, columns 9 and 10 are equal

$\therefore$ $\overline{A \cdot B} = \bar{A} + \bar{B}$

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