Paper 7, TDC Part-3
Discussion of some questions of 2018
Lecture - 1

By:

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Discussion of 2018 Questions

Solved Problems of Questions of "2018"

Q1) For logic operation:

$$Y = A\bar{B} + \bar{A}B$$

(a) Obtain the truth table.

(b) Name the operation performed

(c) Realize operation using AND, OR and NOT gates

(d) Realized this operation using only NAND gates

Discussion of 2018 Questions

Sol^n: 16(a) Logic Operation

$$Y = A\bar{B} + \bar{A}B$$

(a) ~~It~~ Truth table for given logic operation is can be obtained as

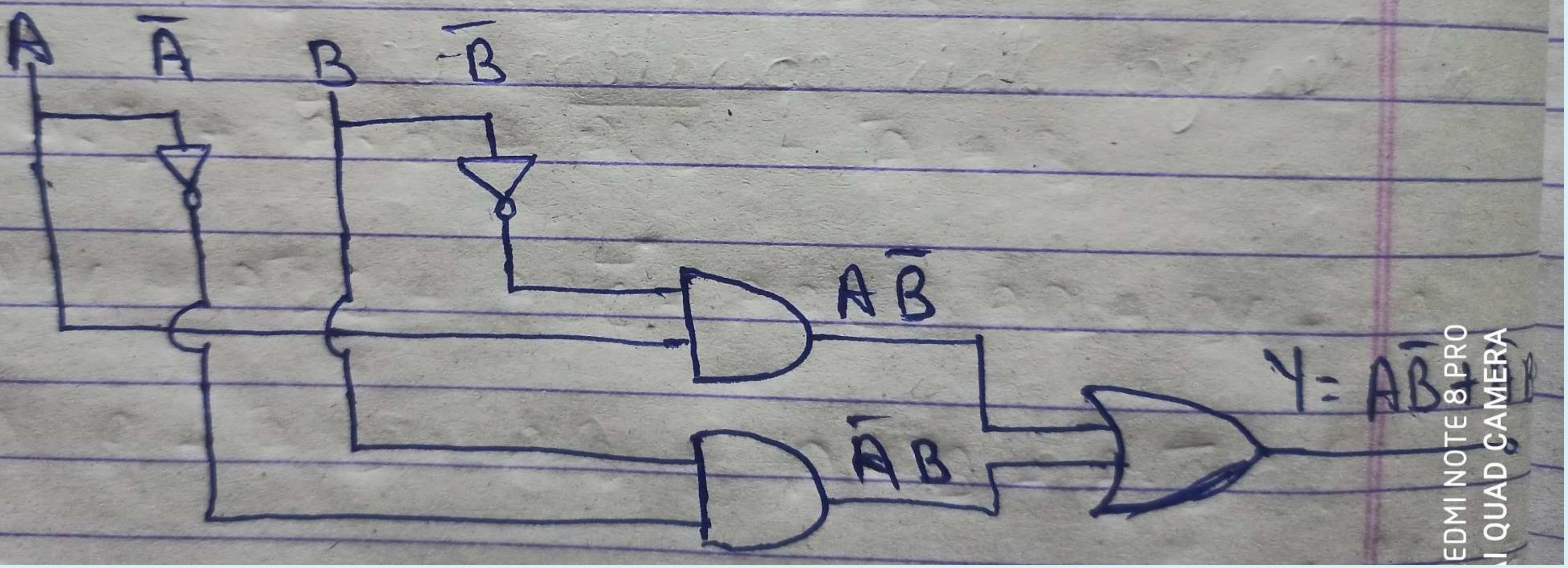
A	B	$A\bar{B}$	$\bar{A}B$	$Y = A\bar{B} + \bar{A}B$
0	0	0	0	0
0	1	0	1	1
1	0	1	0	1
1	1	0	0	0

(b) As the output is True ('High') only when ~~any~~ only one of the input is at logic 'High', otherwise the output is 'False (Low)'. So the operation $Y = A\bar{B} + \bar{A}B$ is "Ex-OR" operation.

Discussion of 2018 Questions

'High', otherwise the output is 'False (Low)'. So the operation
$Y = A\bar{B} + \bar{A}B$ is "Ex-OR" operation.

c) Realizing operation using AND, OR and NOT gates.



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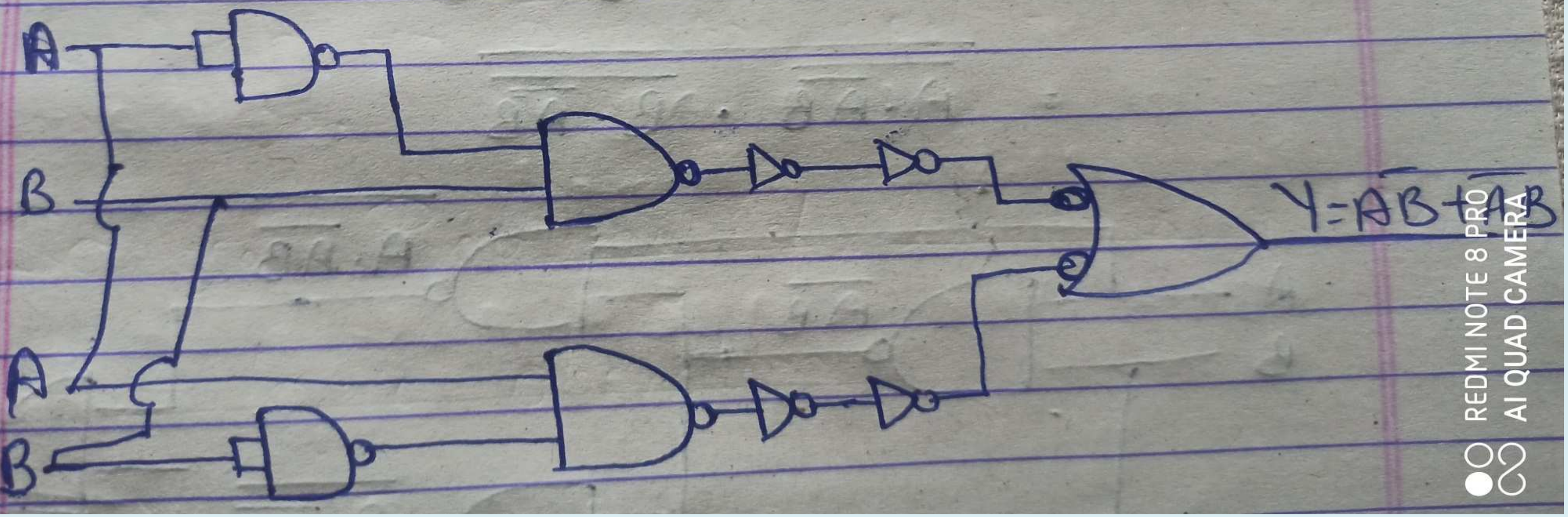
(d) Realizing the operation $Y = A\bar{B} + \bar{A}B$ using NAND gates only.

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

$$\cancel{Y = \overline{A\bar{B}}}$$

$$Y = \overline{\overline{A\bar{B}} \cdot \overline{\bar{A}B}}$$



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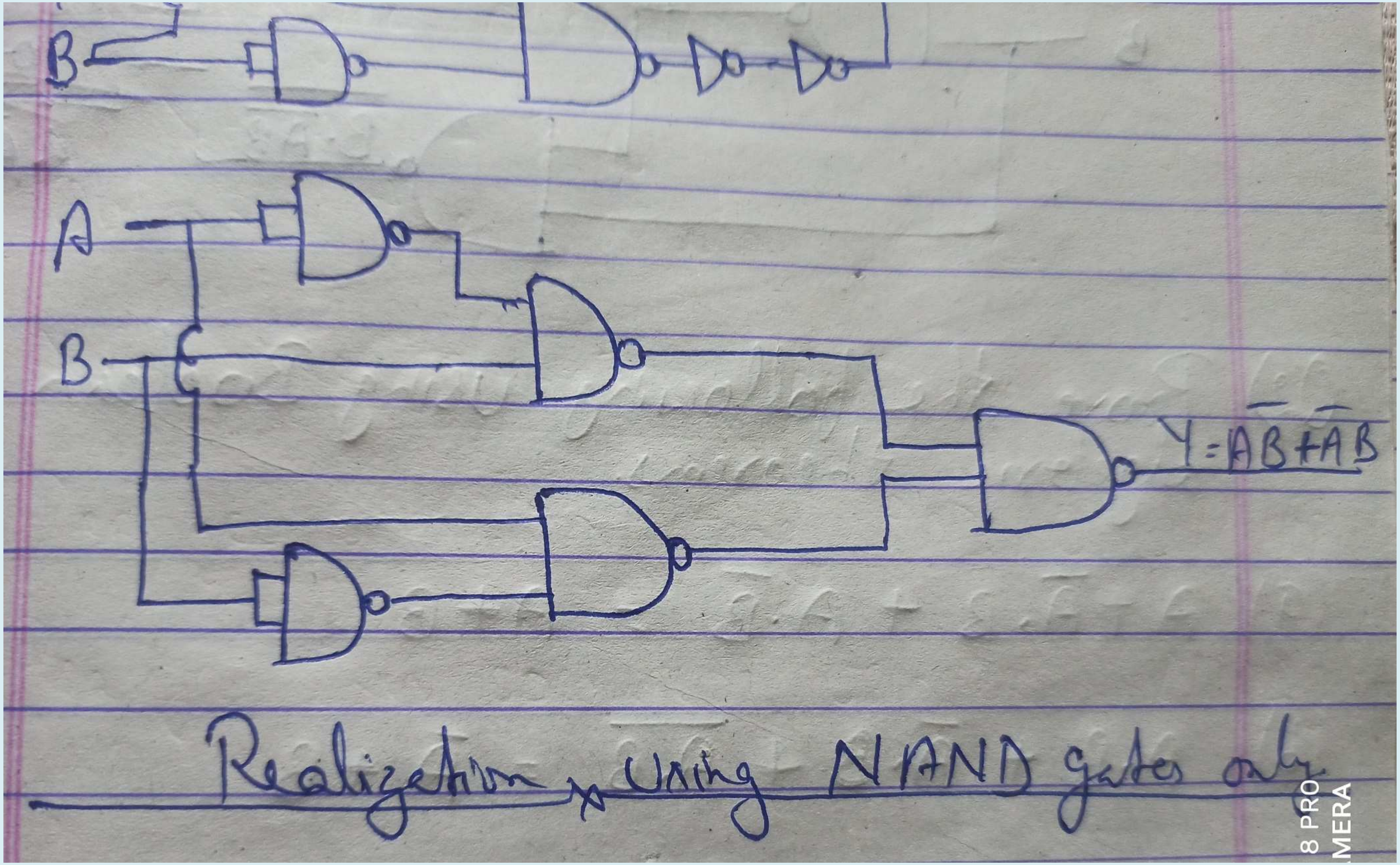


Discussion of 2018 Questions

$Y = A\bar{B} + \bar{A}B$ can be realized using 4-NAND gates only as below,

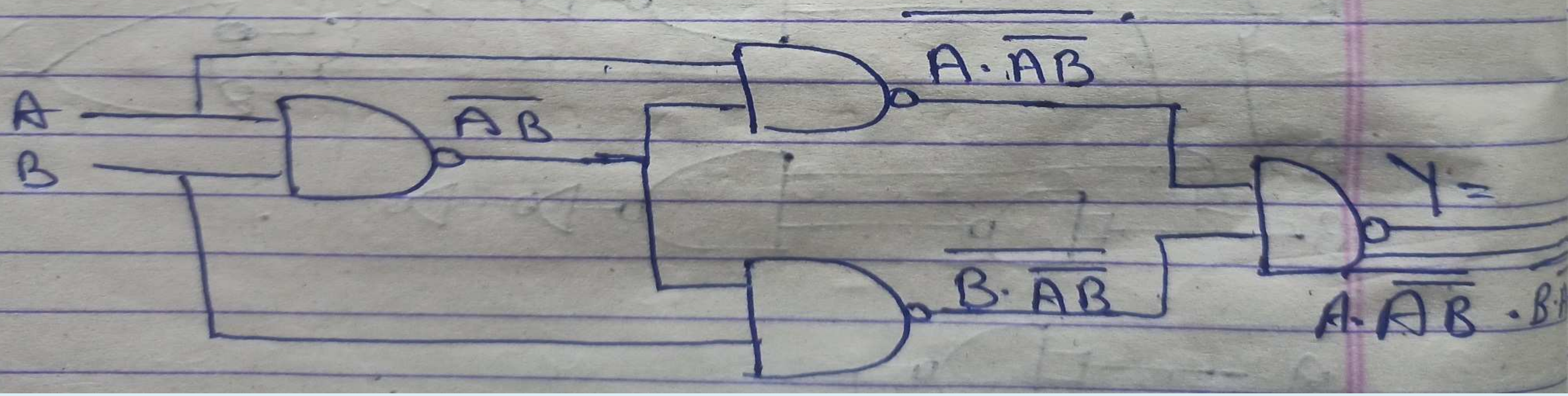
$$Y = A\bar{B} + \bar{A}B = (A+B)(\bar{A}+\bar{B})$$

$$= (A+B)(\overline{AB}) \quad \text{(Using De'morgans Theorem)}$$

$$= A\cdot\overline{AB} + B(\overline{AB})$$

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

$$= \overline{\overline{A\cdot\overline{AB}}\cdot\overline{B\cdot\overline{AB}}}$$



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Q2) Prove the following using Boolean algebric theorems.

(a) $A + \bar{A}\cdot B + A\cdot\bar{B} = A + B$

(b) $A\cdot B + \bar{A}\cdot B + \overline{A\cdot B} = \bar{A} + B$

(c) $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC = AB + BC + CA$

Soln: (a) $A + \bar{A}\cdot B + A\cdot\bar{B} = A + B + A\cdot\bar{B}$ [A+

theorem $A+\bar{A}B$

$A+B$

Discussion of 2018 Questions

$= A + (B + A\bar{B})$

$= A + (B + A)$ [Again as per theorem $A + \bar{A}B = A + B$]

$= A + B + A$

$= (A + A) + B$

$= A + B$ [$\because A + A = A$]

L.H.S = R.H.S proved

i.e.

$A + \bar{A}B + A\bar{B} = A + B$ proved

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(b) $A\cdot B + \bar{A}\cdot B + \overline{A\cdot B} = \bar{A} + B$

proof :-

R.H.S. $\Rightarrow A\cdot B + \bar{A}\cdot B + \overline{A\cdot B}$

$= B(A+\bar{A}) + \overline{A\cdot B}$

$= B + \overline{A\cdot B}$ $[A+\bar{A} = 1]$

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

$= 1 + \bar{A}$

$= 1$

$\boxed{\text{Note:-}}$ This question not seems ~~to~~ ok, so students are advised to ~~leave~~ do the solution ~~till~~ do that I have solved.

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1) $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC = AB + BC + CA$

Proof :-

R.H.S. $\bar{A}BC + ABC + A\bar{B}C + ABC + AB\bar{C} + ABC$

[Adding ABC will not change eqn. as $A + A = A$]

$= BC(A+\bar{A}) + AC(B+\bar{B}) + AB(C+\bar{C})$

$= BC + AC + AB$ [$A + \bar{A} = 1$]

$=$ L.H.S   proved

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

proved

Combinational Logic Design

Refer book- Modern Digital Electronics by RP Jain.

Thank You