Paper 7, TDC Part-3
Discussion of some questions of 2017
Lecture - 25

By:

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Discussion of 2017 Questions

Discussion of a Few Questions of "2017"
Paper - ~~I~~ (VII)

(1.) Prove the following using De Morgan's Theorem:

(a) $AB + CD = \overline{\overline{AB} \cdot \overline{CD}}$

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

Hence prove the following statements:

(a) An AND-OR configuration is equivalent to a NAND-NAND configuration.

(b) An OR-AND configuration is equivalent to a NOR-NOR configuration.

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Soln:- → 1(a) $AB + CD$

Let $AB = X$ & $CD = Y$

then above function can be written as

$$AB + CD = X + Y = \overline{\overline{X + Y}} \qquad [\because \overline{\overline{A}} = A]$$

$$= \overline{\overline{X} \cdot \overline{Y}} \qquad [\because \text{per De Morgan's Theorem } \overline{A+B} = \overline{A} \cdot \overline{B}]$$

Now putting value of X & Y we get

$$AB + CD = \overline{\overline{AB} \cdot \overline{CD}}$$

proved.

1(b) $(A+B) \cdot (C+D)$

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1(b) $(A+B)\cdot(C+D)$

Let $(A+B) = U$ & $(C+D) = V$

then above function can be written as

$$(A+B)\cdot(C+D) = U\cdot V$$

$$= \overline{\overline{U}\cdot\overline{V}} \qquad [\text{As } \overline{\overline{A}} = A]$$

$$= \overline{\overline{U} + \overline{V}} \qquad [\text{As per DeMorgan's Theorem } \overline{A\cdot B} = \overline{A} + \overline{B}]$$

Now putting value of U & V above,

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

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(a) The LHS of 1(a) can be realized using two 2-input AND gates followed by one 2-input OR gate, while the RHS can be realized by two 2-input NAND gates followed by another 2-input NAND gate. Hence an AND-OR configuration is equivalent to a NAND-NAND configuration. Also, AND-OR and NAND-NAND configuration both are two level configuration.

(b) The LHS of 1(b) can be realized using two 2-input OR gates followed by one 2-input AND gate, while the RHS can be

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(b) The LHS of 1(b) can be realized using two 2-input OR gates followed by one 2-input AND gate, while the RHS can be realized by two 2-input NOR gates followed by another 2-input NOR gate. Hence an OR-AND configuration is equivalent to a NOR-NOR configuration. Also OR-AND and NOR-NOR configuration both are two level configuration.

Q2) Realize the logic equation using EX-OR gates:

$$Y = A \oplus B \oplus C \oplus D$$

Sol:- The logic function $Y = A \oplus B \oplus C \oplus D$ can be realized using EX-OR gate with 2 nos. of input, or 3 nos. of input plus 2 nos. of input or 4 nos. of input.

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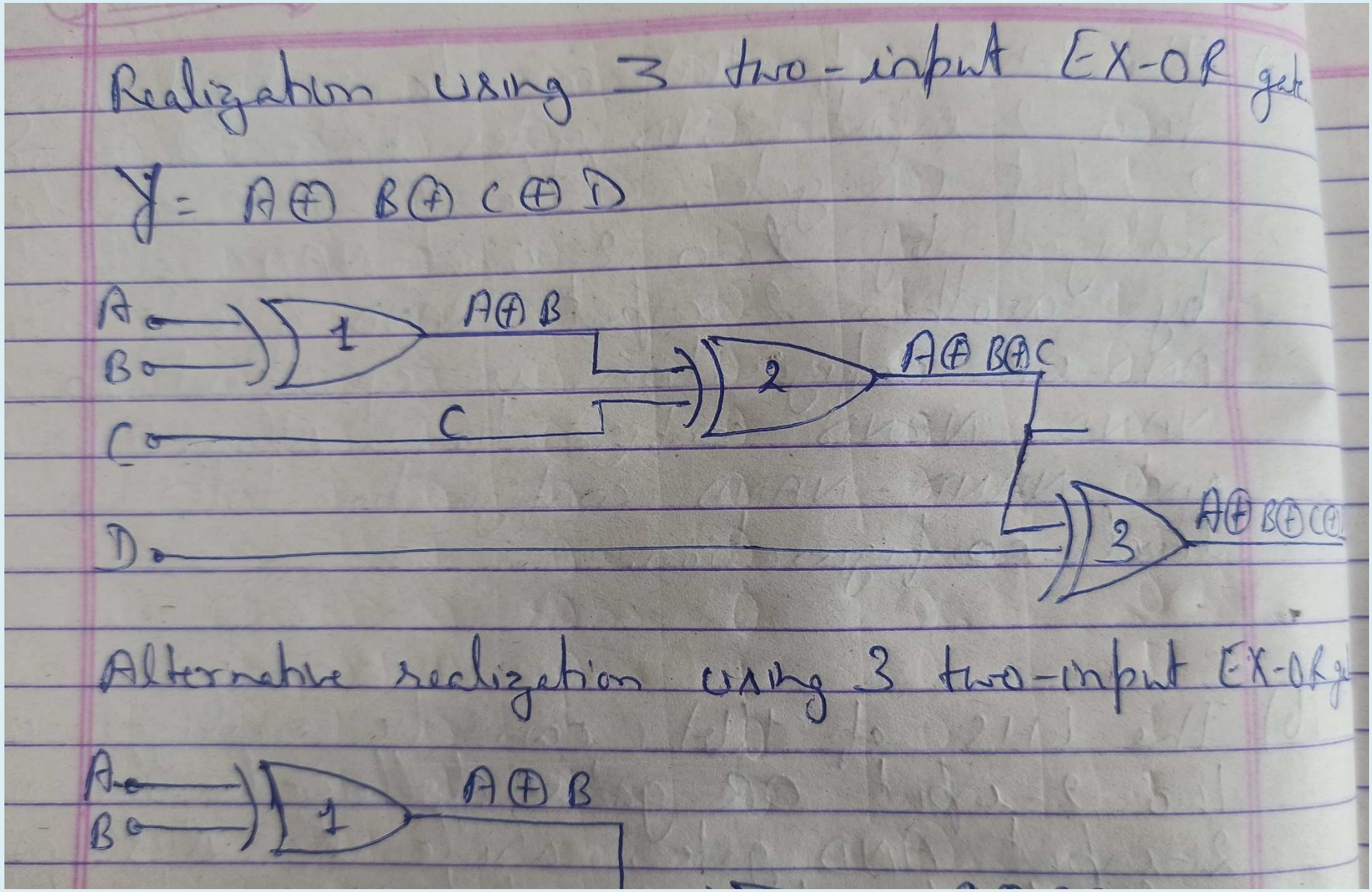

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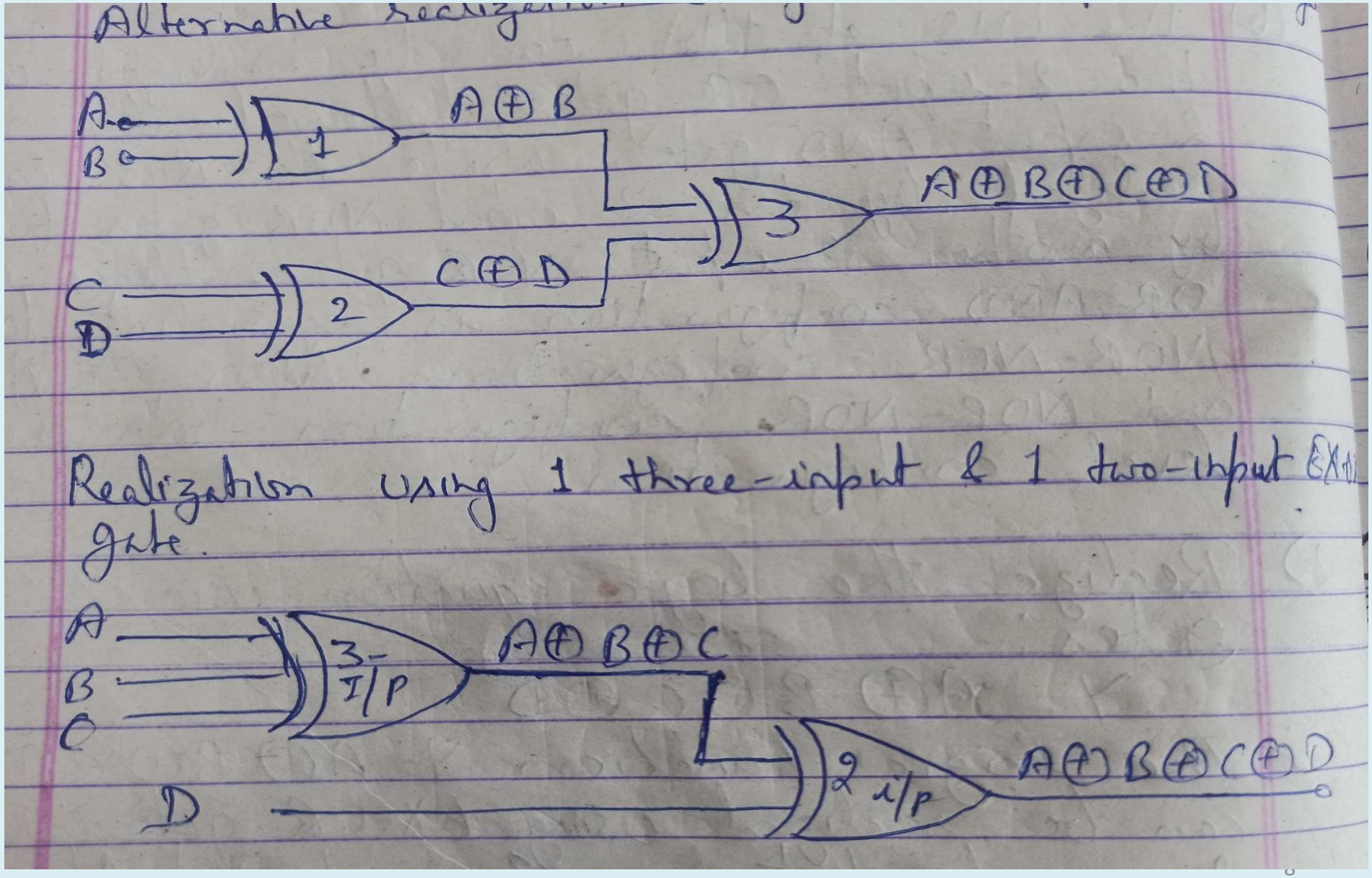
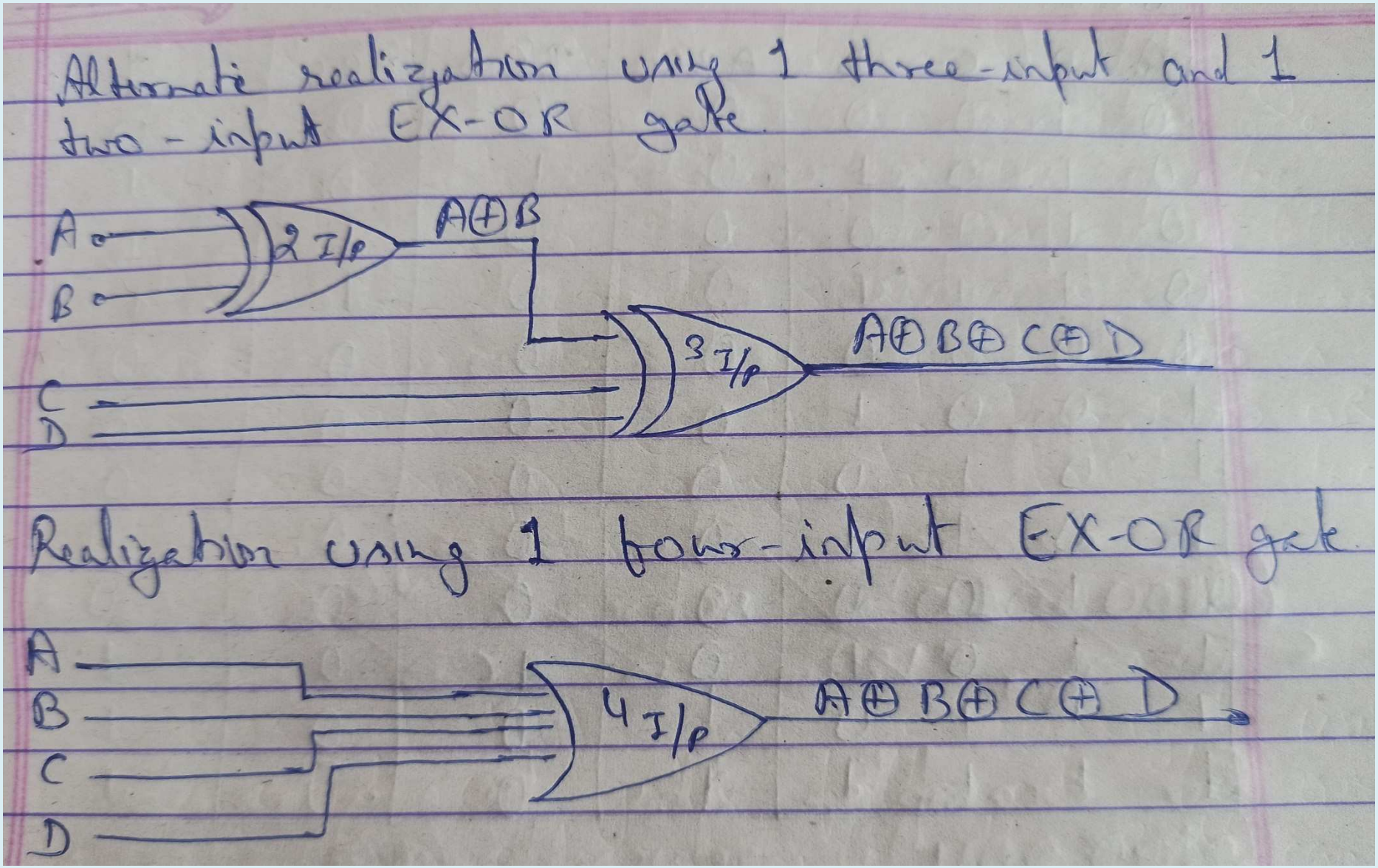


Discussion of 2017 Questions



Combinational Logic Design

Refer book- Modern Digital Electronics by RP Jain.

Thank You