

NEW

Semester - II

FEEE

Chapter - 3

Overview of Digital Electronics

Analog and digital signal, advantages of digital system. Introduction to Logic levels and Boolean Algebra, Basics of number system, Logic Gates-Truth Table and Symbol of AND, OR, NOT, NAND, NOR, ExOR, ExNOR Gates. Introduction to Latch, Flip Flops, Combinational Circuit and Sequential Circuit.

Boolean Algebra (बुलियन बीजगणित)

- वह बीजगणित जिसके विभिन्न ऑपरेशन तर्क पर आधारित होते हैं तथा लॉजिक गेट द्वारा प्राप्त किए जाते हैं बुलियन बीजगणित कहलाती है।
The algebra whose various operations are based on logic and are achieved by logic gates is called Boolean algebra.
- Boolean's Laws (बुलियन के नियम)
 - (1) AND Law
 - (2) OR Law
 - (3) NOT Law (Complementation Law - पूरक नियम)
 - (4) Commutative Law (क्रम विनिमय नियम)
 - (5) Associative Law (साहचर्य नियम)
 - (6) Distributive Law (वितरण नियम)
 - (7) Duality Law (ड्यूलिटी नियम)

(1) AND Law

$$(a) \quad A \cdot 0 = 0$$

$$(b) \quad A \cdot 1 = A$$

$$(c) \quad A \cdot A = A$$

$$(d) \quad A \cdot \bar{A} = 0$$

(2) OR Law

$$(a) \quad A + 0 = A$$

$$(b) \quad A + 1 = 1$$

$$(c) \quad A + \bar{A} = 1$$

$$(d) \quad A + A = A$$

(3) NOT Law (Complementation Law - पूरक नियम)

$$(a) \quad \overline{0} = 1$$

$$(b) \quad \overline{1} = 0$$

$$(c) \quad \overline{\overline{A}} = A$$

$$(d) \quad \overline{\overline{\overline{A}}} = \overline{A}$$

Note:- ① यदि Input variable पर सम संख्या (Even No.) में complement हो तो output वही। complement का आरम्भ

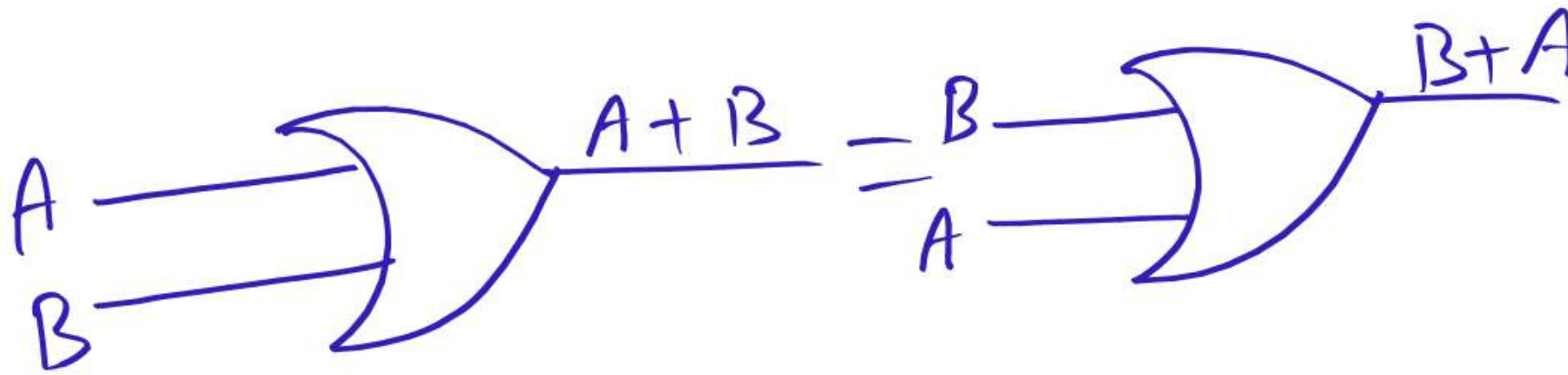
② यदि Input variable पर विषम संख्या (odd No.) में complement हो तो output complement के साथ आरम्भ

$$(3) \quad A \cdot A \cdot A \cdot A \cdots \cdots \cdot A = A$$

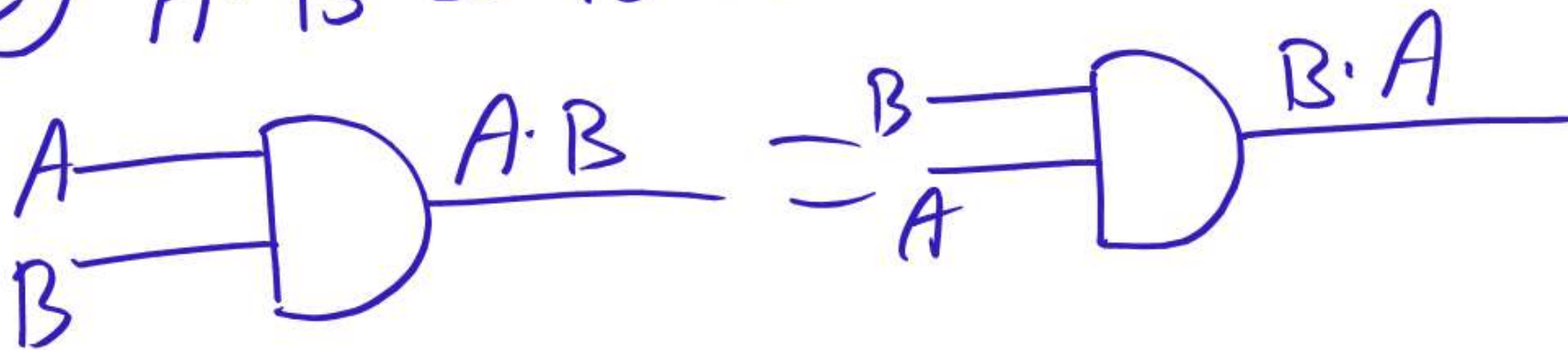
$$(4) \quad A + A + A + \cdots \cdots + A = A$$

(4) Commutative Law (क्रम विनिमय नियम)

$$\textcircled{1} \quad A + B = B + A$$

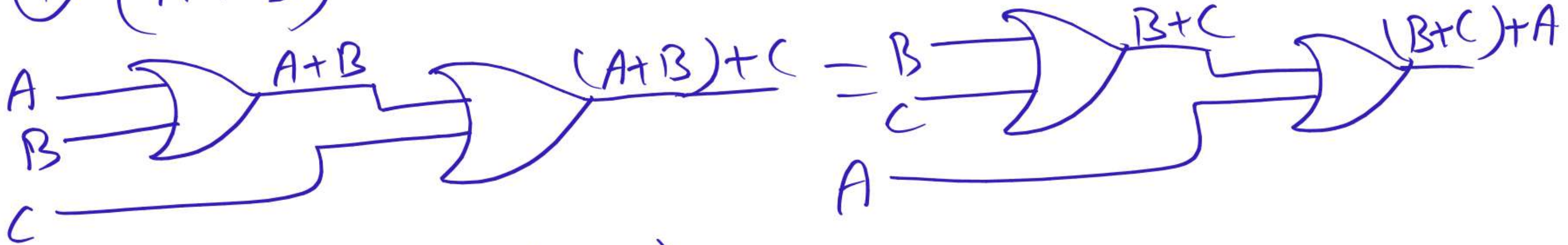


$$\textcircled{2} \quad A \cdot B = B \cdot A$$

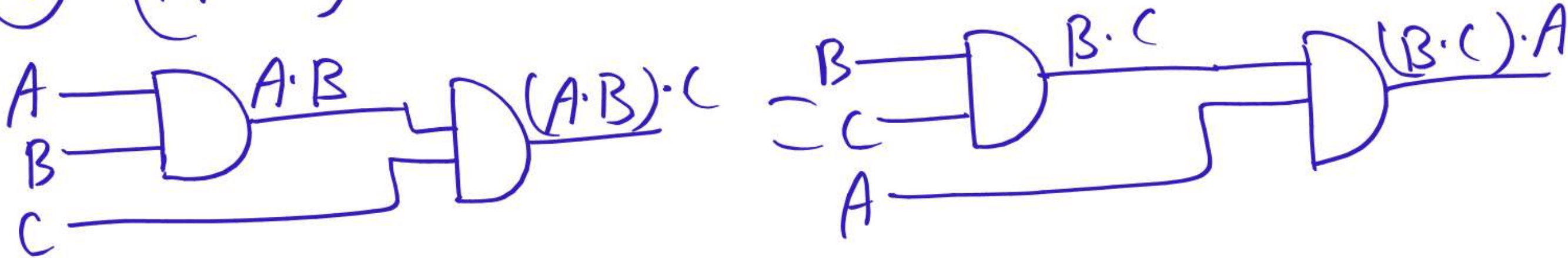


(5) Associative Law (साहचर्य नियम)

$$\textcircled{1} (A+B)+C = A+(B+C)$$

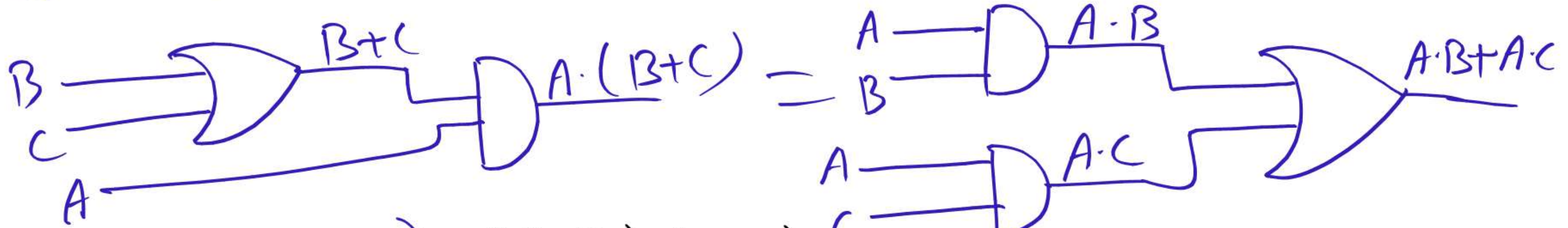


$$\textcircled{2} (A \cdot B) \cdot C = A \cdot (B \cdot C)$$



(6) Distributive Law (वितरण नियम)

$$\textcircled{1} A \cdot (B + C) = A \cdot B + A \cdot C$$



$$\textcircled{2} A + (B \cdot C) = (A + B) \cdot (A + C)$$

(7) Duality Law (ड्यूलिटी नियम)

Given Expression

$$\overline{0} = 1$$

$$0 \cdot 1 = 0$$

$$1 + 1 = 1$$

$$A + A = A$$

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

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

Dual Expression

$$\overline{1} = 0$$

$$0 + 1 = 1$$

$$0 \cdot 0 = 0$$

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

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

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