Q.1

For the circuit given below, all NOT Gates are identical to each other and having propagation delay 10 ps. Find the frequency of generated wave form?

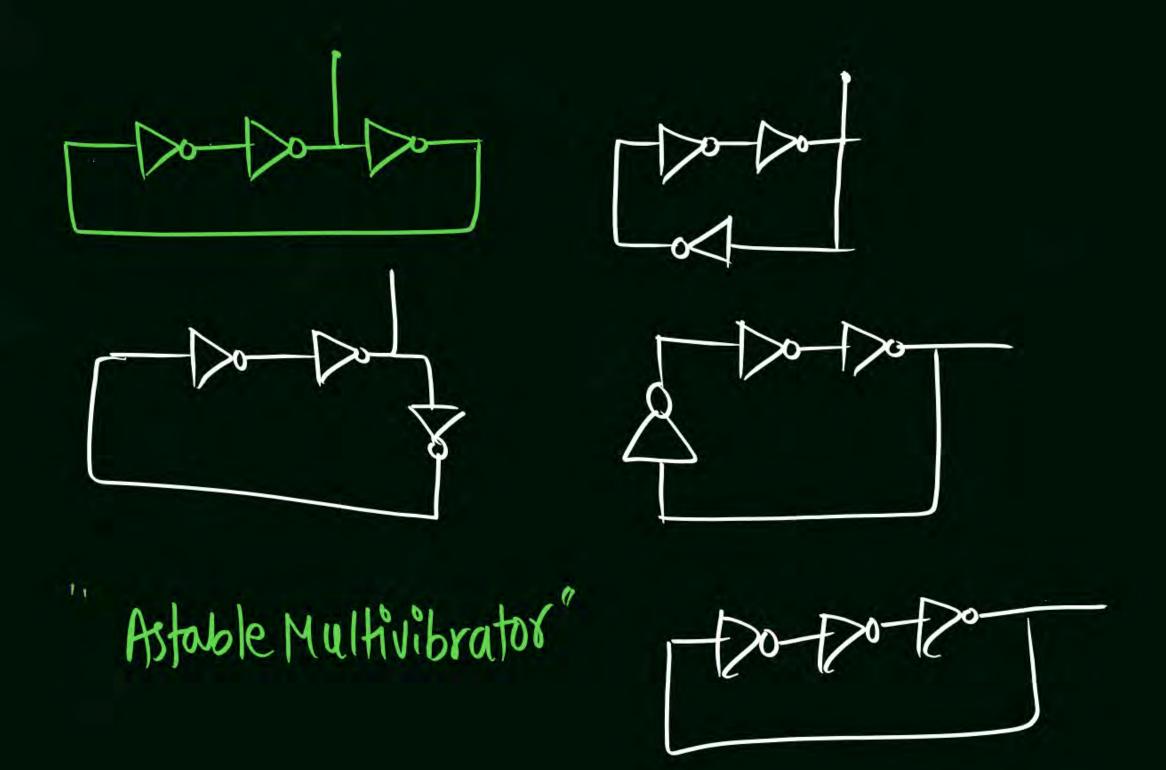$$f = \frac{1}{2N \times \tau_{pd}}$$

$$f = \frac{1}{2 \times 5 \times 10 \times 10^{-12}} = 10\,GHz$$

Q.2
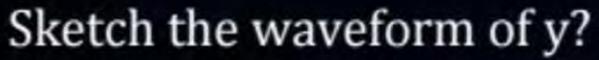
Circuit given below are called.

y

(A) Astable Multivibrator

(B) Bistable Multivibrator

"Astable Multivibrator"

Sketch the waveform of y?

τ_{pd} τ_{pd} τ_{pd} $\boxed{6\tau_{pd}}$ $\boxed{\tau_{pd}}$

x

$y = \bar{x}$

$$T = 6\tau_{pd}$$

Q.4

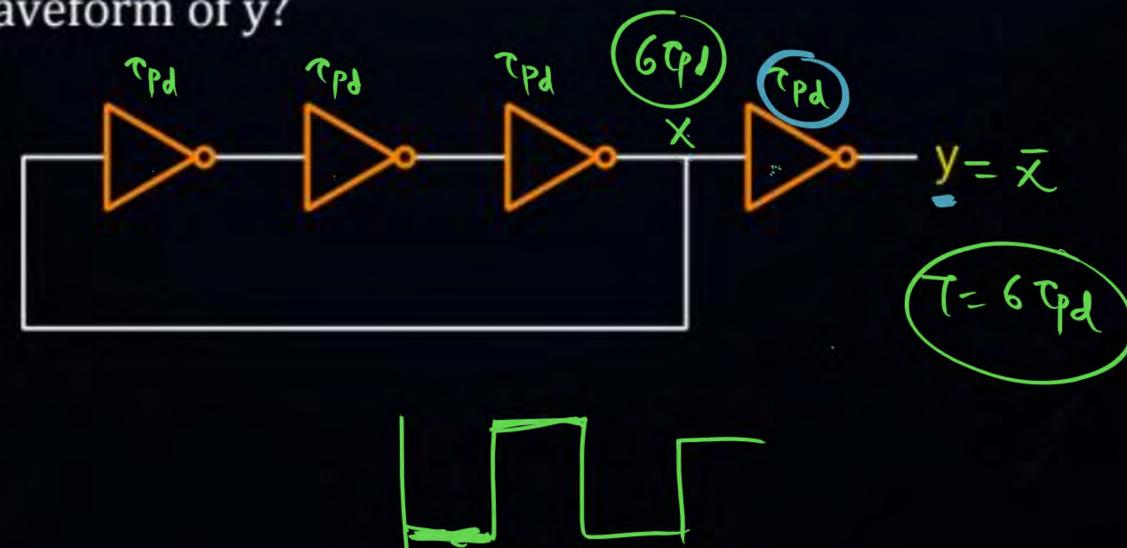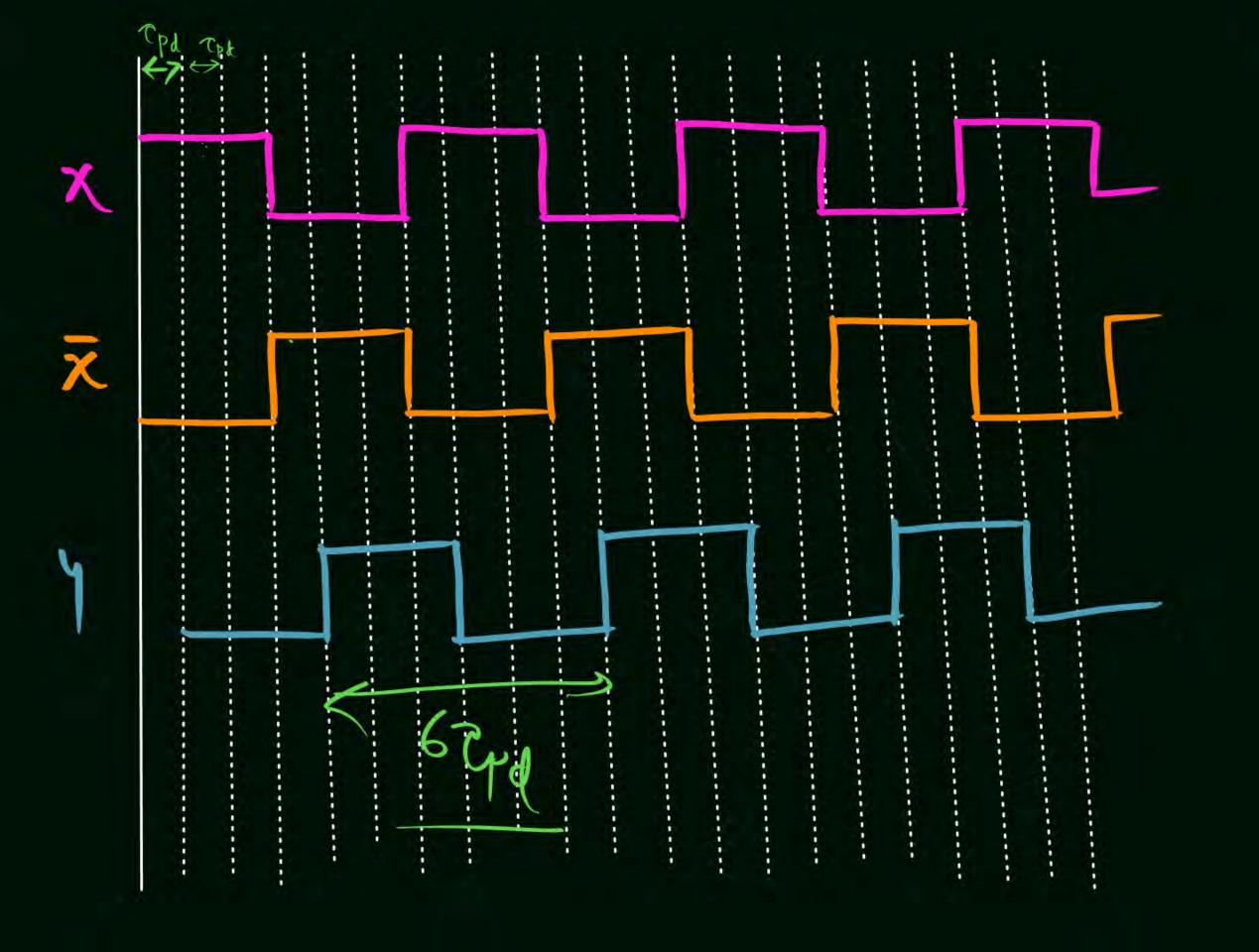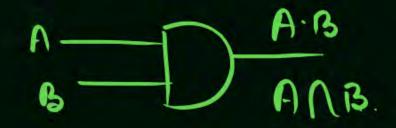For the circuit given below x & y condition will be–

A x stable y toggle

B x toggle y stable

C x & y both toggle

D x & y both stable

$$A \xrightarrow{\qquad} \quad \boxed{\;} \quad \frac{A \cdot B}{A \cap B}$$

$$B \xrightarrow{\qquad}$$

$$\{1, 2, 3, \boxed{4, 5}\}$$

$$\{\boxed{4, 5}, 6, 7\} \quad \longrightarrow \quad \{4, 5\}$$

AND [∩]

$$0 \cdot 0 = 0$$
$$0 \cdot 1 = 0$$
$$1 \cdot 0 = 0$$
$$1 \cdot 1 = 1$$
$$1 \cdot A = A$$
$$1 \cdot \bar{A} = \bar{A}$$
$$A \cdot 0 = 0$$
$$\bar{A} \cdot 0 = 0$$
$$A \cdot A = A$$
$$A \cdot \bar{A} = \ddot\smile$$

OR [∪]

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

$$1 + AB = 1$$

Beautiful

Brother

Palani hai

AND GATE

- ## AND GATE

1. Symbol

A ——⊃ y=A.B
B ——

2. Symbol

→ Relation b/w inputs & outputs.

	Truth Table	
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

③ Enable / Disable :

$A = 0, 1$ $y = 0, 0$

0

Control '0' Disable

✓ floating terminal
✓ Control input
✓ Strobe.

$A = 0, 1$ $Y = 0, 1$

1

Control '1' Enabled.

AND GATE

- **AND GATE**

3. Enable/Disable

Enable

A ⊐D A

.I

A ⊐D 0 Disable

0I

4. Commutative Law

A. B = B. A ✓
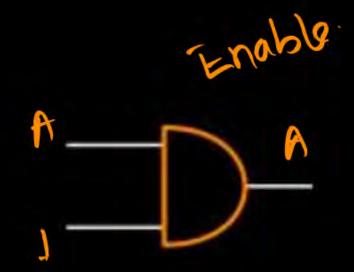
Associative Law
A. B. C = (A. B). C

Associative Law

$$(A \cdot B) \cdot C = A \cdot (B \cdot C)$$

$\text{TTL} \rightarrow$ Transistor Transistor Logic.

A ———

$A \cdot L = A$

1

When Logics are design by (TTL):

Q.

$\bar{A}$

$1 \cdot \bar{A} = \bar{A}$

$y : \bar{\bar{A}} = A$

(A) 1

(B) 0

(C) $\bar{A}$

(D) A

(E) Sir, Mujhe nahi ata. Mai Tare jameen par hu.

$(\underline{\underline{E C L}}) \rightarrow$ Emitter coupled Logic

A ————⊐
⊐— $A \cdot \underline{\underline{0}} = 0$
$0 \{$ ————⊐

AND GATE

- **NOTE**

1. Whenever logic are designed by TTL (Transistor transistor logic) then floating terminal always works as a high.
2. Whenever logic are designed by ECL (Emitter coupled logic) then floating terminal always works as a low.

① Symbol

$$A \longrightarrow \quad \frac{A+B}{A \cup B}$$

Ex. $\{1,2,3\}$

$y = \{1,2,3,4,5\}$

$\{3,4,5\}$

② Truth table :→

A	B	Y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

③ Enable/Disable

$A = 0, 1$ $Y = 0, 1$

0

Control '0' Enable

$A\ 0, 1$ $Y = 1, 1$

1
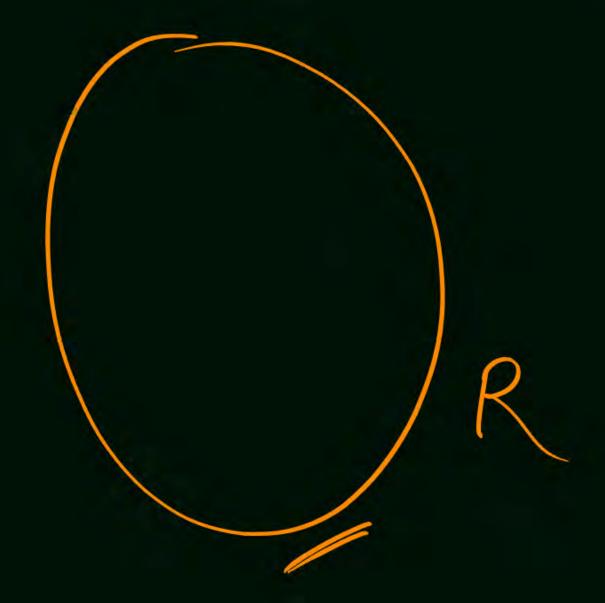
Control '1' Disabled.

Commutative Law

$$A + B = B + A \quad \checkmark$$

Associative Law $\checkmark$

$$(A + B) + C = A + (B + C)$$

R

NAND GATE :→

A
B → A·B → AB → ▷○ → $\overline{AB}$

A
B → $\overline{A \cdot B}$

De-Morgan's Law → Sabka Bar to chota chota Bar.
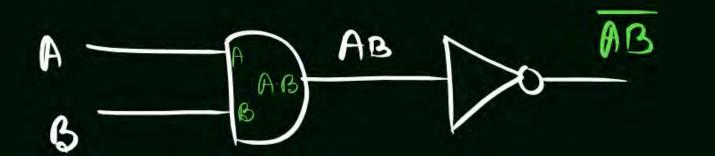
↳ Break the line, change the sign.

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

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

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

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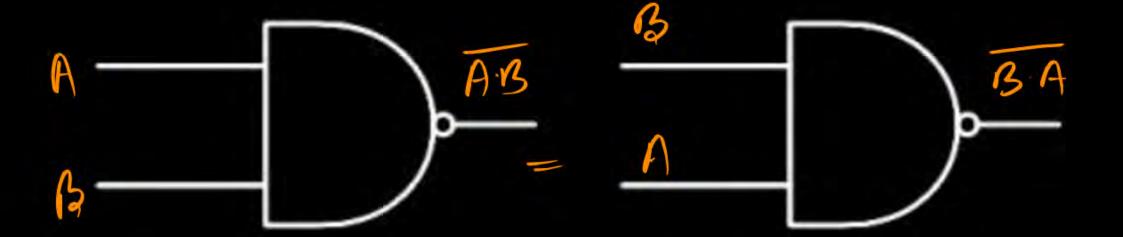
$$\overline{A} + \overline{B}$$

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

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

NAND

Bubbled OR

1. Symbol

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

2. Truth Table

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

3. Enable/Disable

$A = 0, 1$

$Y = 1, 1$

$A = 1, 0$

$Y = 0, 1$

0

Control '0' Disable

1

Control '1' Enable.

Check carefully.

4. Commutative Law ✓

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

A
B

Associative Law:

$$\overline{A \cdot B \cdot C} \quad \neq \quad \overline{\overline{A \cdot B} \cdot C}$$

Inputs: A, B, C (NAND gate) → $\overline{A \cdot B \cdot C}$

Second circuit: A, B → $\overline{A \cdot B}$, then with C → $\overline{\overline{A B} \cdot C}$

Does not follow associative Law

1. Symbol

$$A \quad \xrightarrow{\quad A \quad} \quad \overline{A+B}$$

$$A+B$$

$$B \quad \xrightarrow{\quad B \quad} \quad \overline{A \cdot B}$$

$$=$$

$$A \longrightarrow \circ \overline{A}$$

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

$$B \longrightarrow \circ \overline{B}$$

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

Bubbled AND $\equiv$ NOR

2. Truth Table

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

3. Enable/Disable

$A = 0, 1$

$Y = 1, 0$

0

Control '0' Enable.

$A = 0, 1$

$Y = 0, 0$

1

Control '1' Disabled.

4. Commutative Law ✓

NOR gate with inputs A and B, output $\overline{A+B}$, and NOR gate with inputs B and A, output $\overline{B+A}$

Associative Law :→

Left circuit output: $\overline{\overline{(A+B)}+C}$

$$\overline{\overline{(A+B)}+C} \neq$$

Right circuit output: $\overline{A+\overline{B+C}}$

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

Does not follow associative Law

☆ NAND
  NOR } universal Logic

AIR 23

Value Price

$$\left(\underline{\underline{NOT}}\right)$$

AND

$$\begin{array}{c} A \\ B \end{array} \longrightarrow \boxed{} \xrightarrow{\overline{A \cdot B}}$$

$$f = \dfrac{1}{2N \times \tau_{pd}}$$

Thank you GW Soldiers !