CS & IT ENGINEERING

Types of Graphs Part 3

Lecture No. 5

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TOPICS TO BE COVERED

01 Isomorphic Graph

02 Hypercube Graph

03 Operation in graph 1

04 Operation in graph 2

05 Operation in graph 3

Types of graph

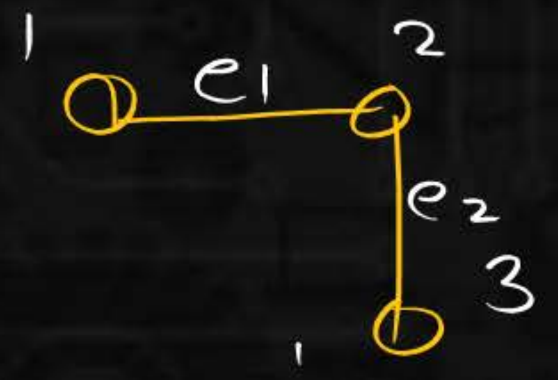
<u>incident point</u> :

meeting point

$\underline{G} = (\underline{V}, \underline{E})$ | $G = (V, E, \psi)$

ψ : { each edge is associated $\rightarrow$ unordered pair

Types of graph



Function : $f : \underline{\underline{Z}} \rightarrow \underline{\underline{Z}}$

i/p $\longrightarrow \boxed{x^2} \longrightarrow$ o/p.

$f(x) = x^2$.

x.

$1 \longrightarrow 1$

$2 \longrightarrow 4$.

$e1 \rightarrow (1, 2)$

$e2 \rightarrow (2, 3)$

$G = (V, E, \psi)$

$$\boxed{\psi : E \rightarrow V \times V}$$

Types of graph

Iso/morphic :

same — property

G_1, G_2 are isomorphic to each other if they have same incident property.

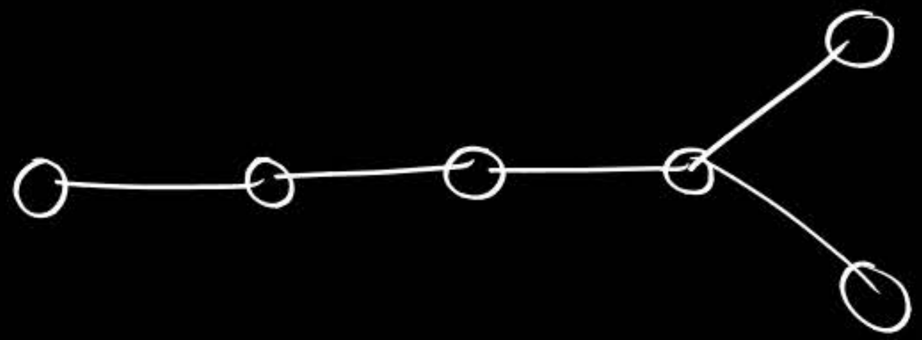
→ same no. of vertices.

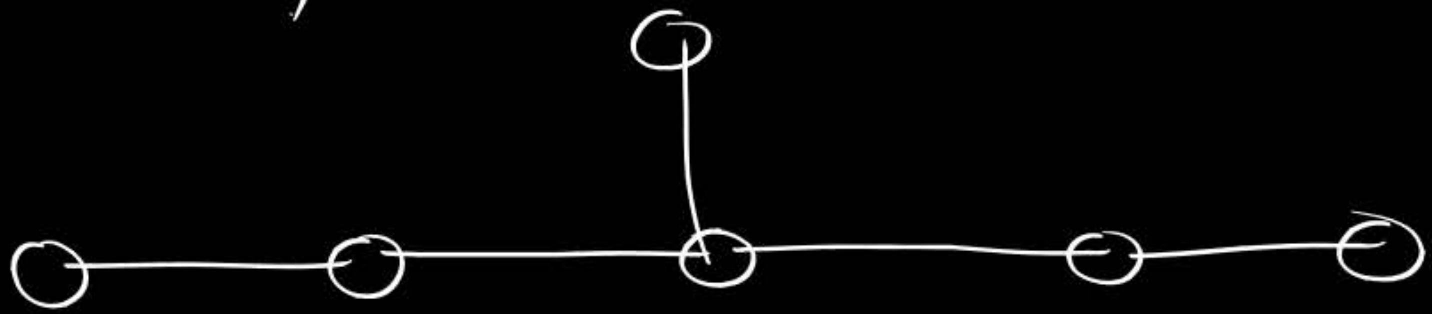
→ same no. of edges.

→ Same degree sequence.

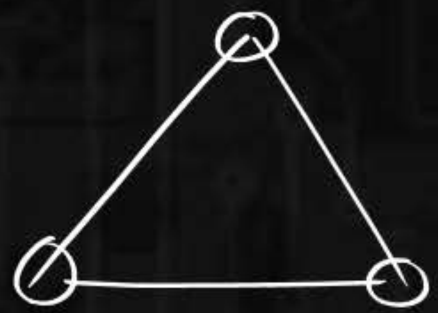
isomorphic $\rightarrow$ same no. of V, E, Degree sequence.

same no. of V, E, degree sequence $\not\rightarrow$ isomorphic.





Types of graph



$n = 3$

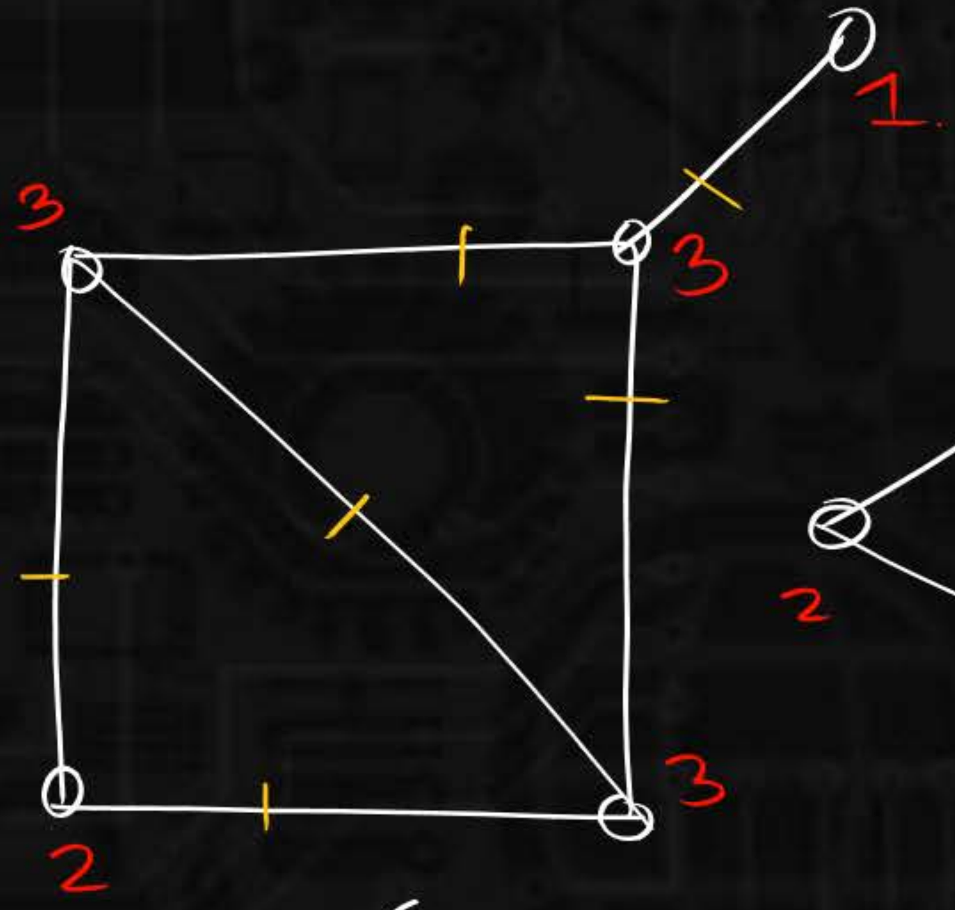
$e = 3$

2 2 2

$n = 3$

$e = 3$

2 2 2.

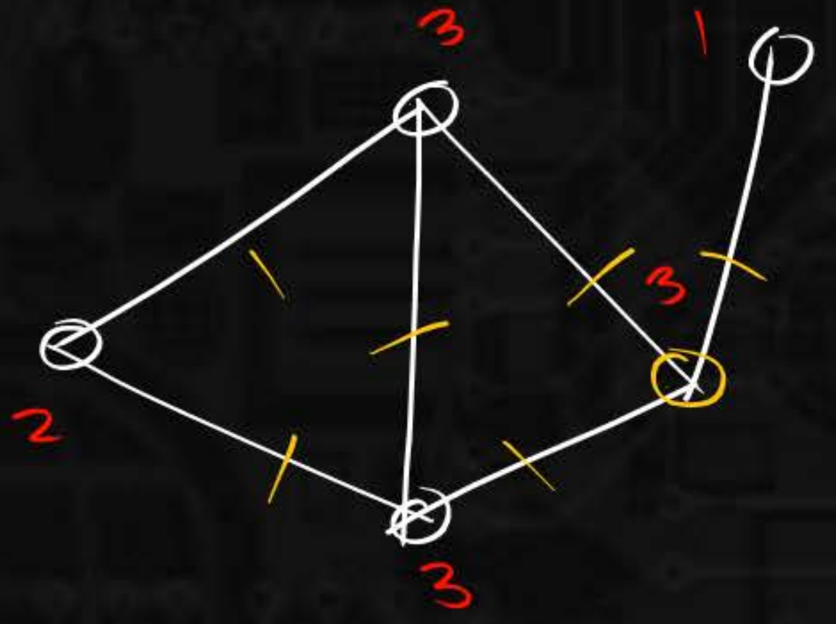


G_1

$n = 5$

$e = 6$

3 3 3 2 1.



G_2

$n = 5.$

$e = 6.$

3 3 3 2 1.

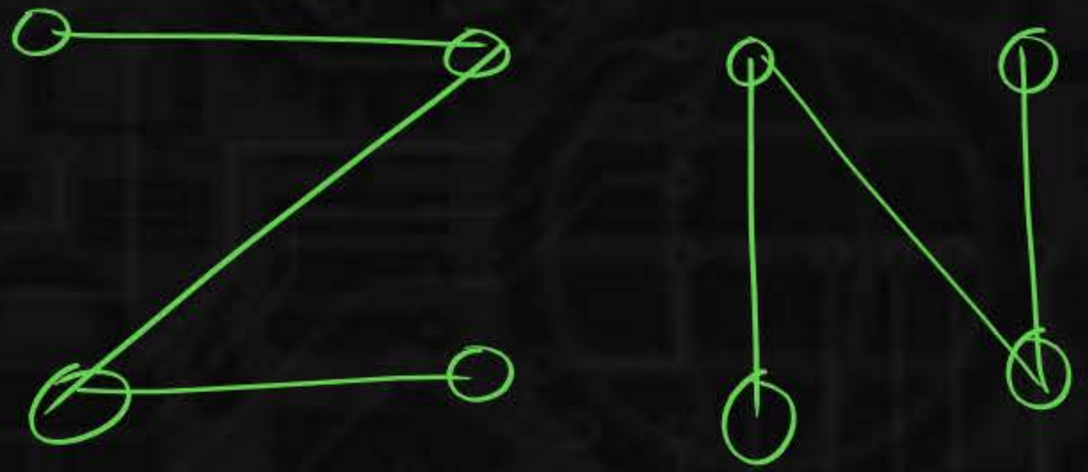
Types of graph

1 Graph → different drawings.

Self-complement.

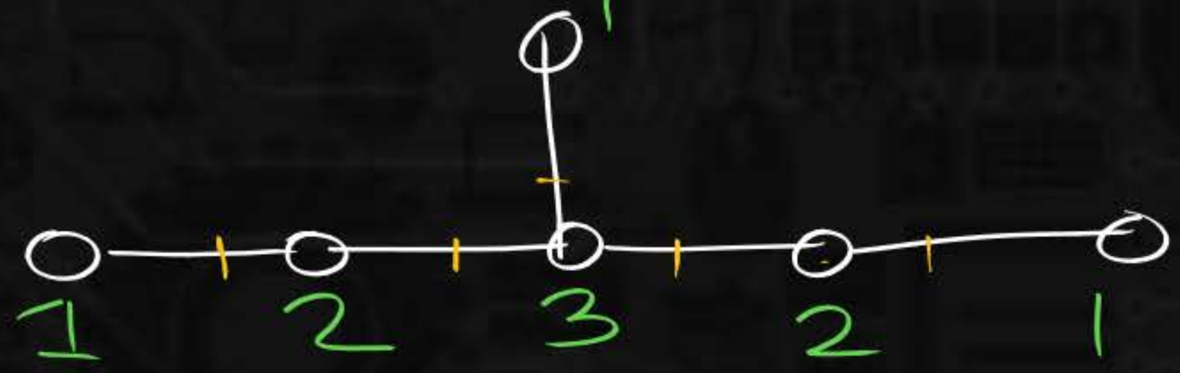
1. $G \equiv \overline{G}$

2. if Graph is isomorphic to it's own complement.



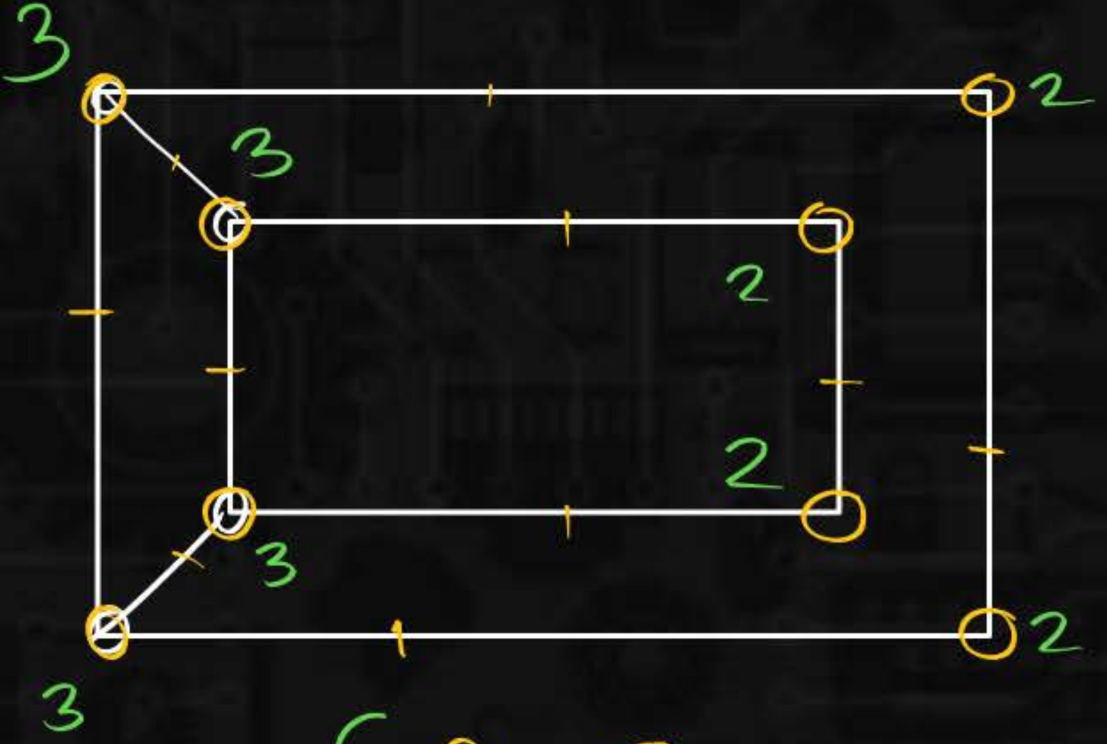
Types of graph

$$\begin{cases} n = 6 \\ e = 5 \\ 3\ 2\ 2\ 1\ 1\ 1 \end{cases}$$



$$\begin{cases} n = 6 \\ e = 5. \\ 3\ 2\ 2\ 1\ 1\ 1. \end{cases}$$

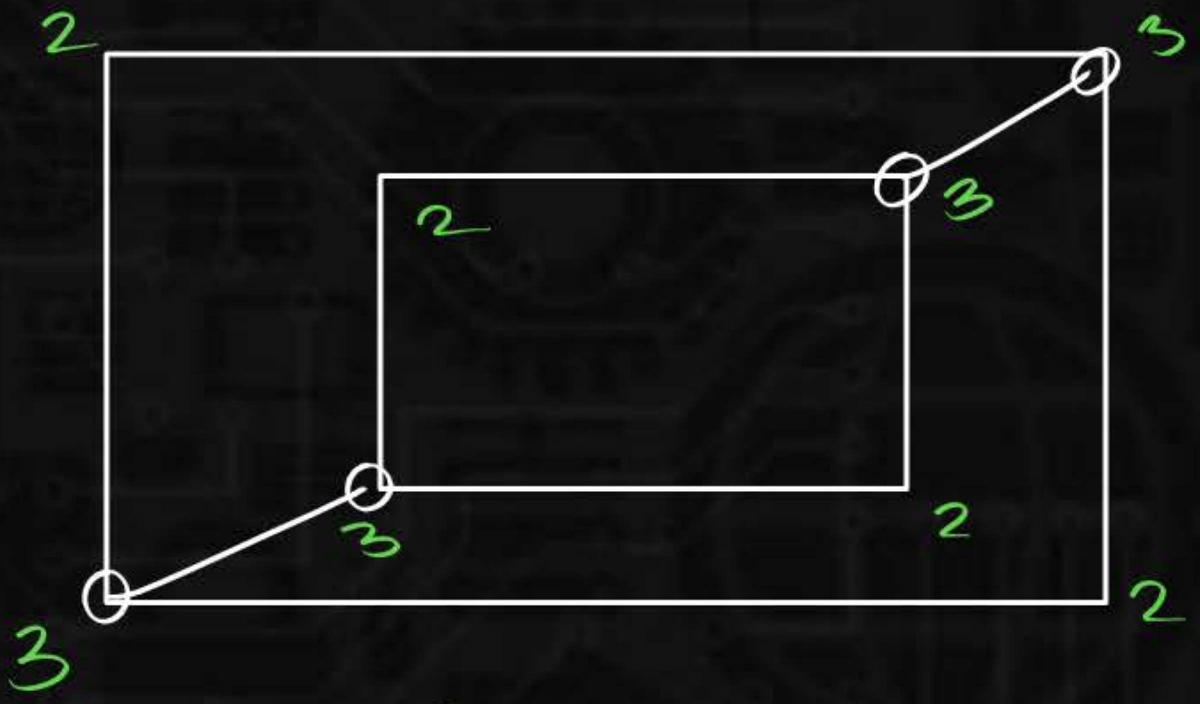
Types of graph



$n = 8$

$e = 10$

3 3 3 3 2 2 2 2

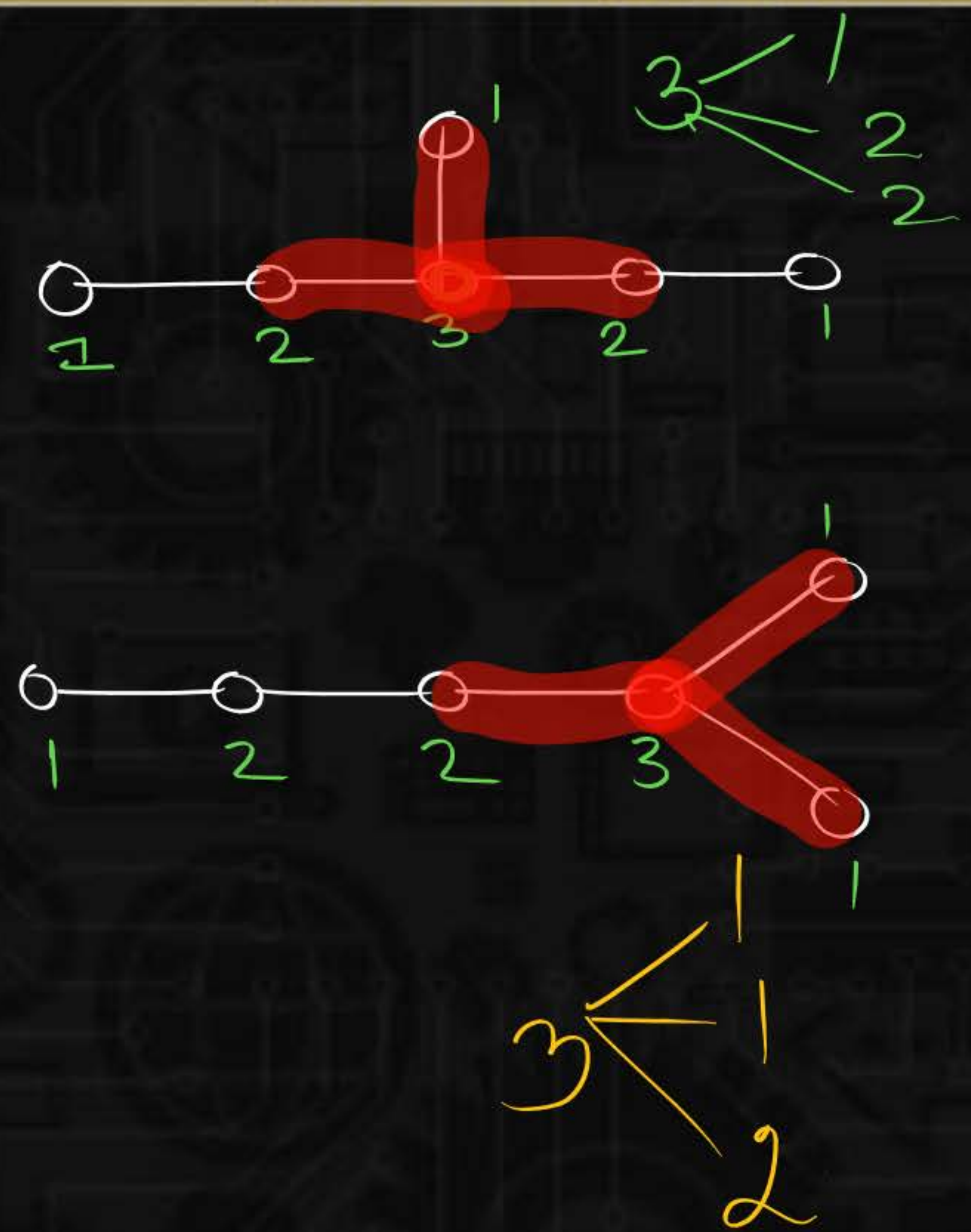


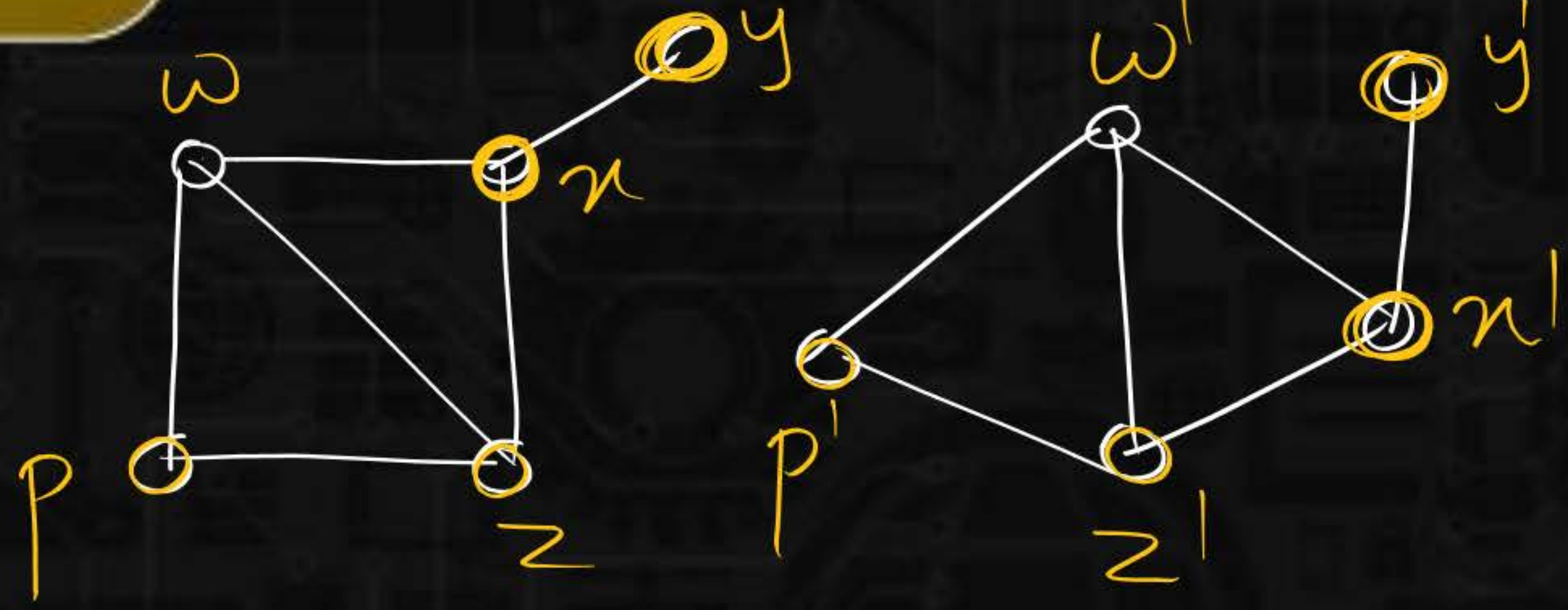
$n = 8$

$e = 10$

3 3 3 3 2 2 2 2

Types of graph

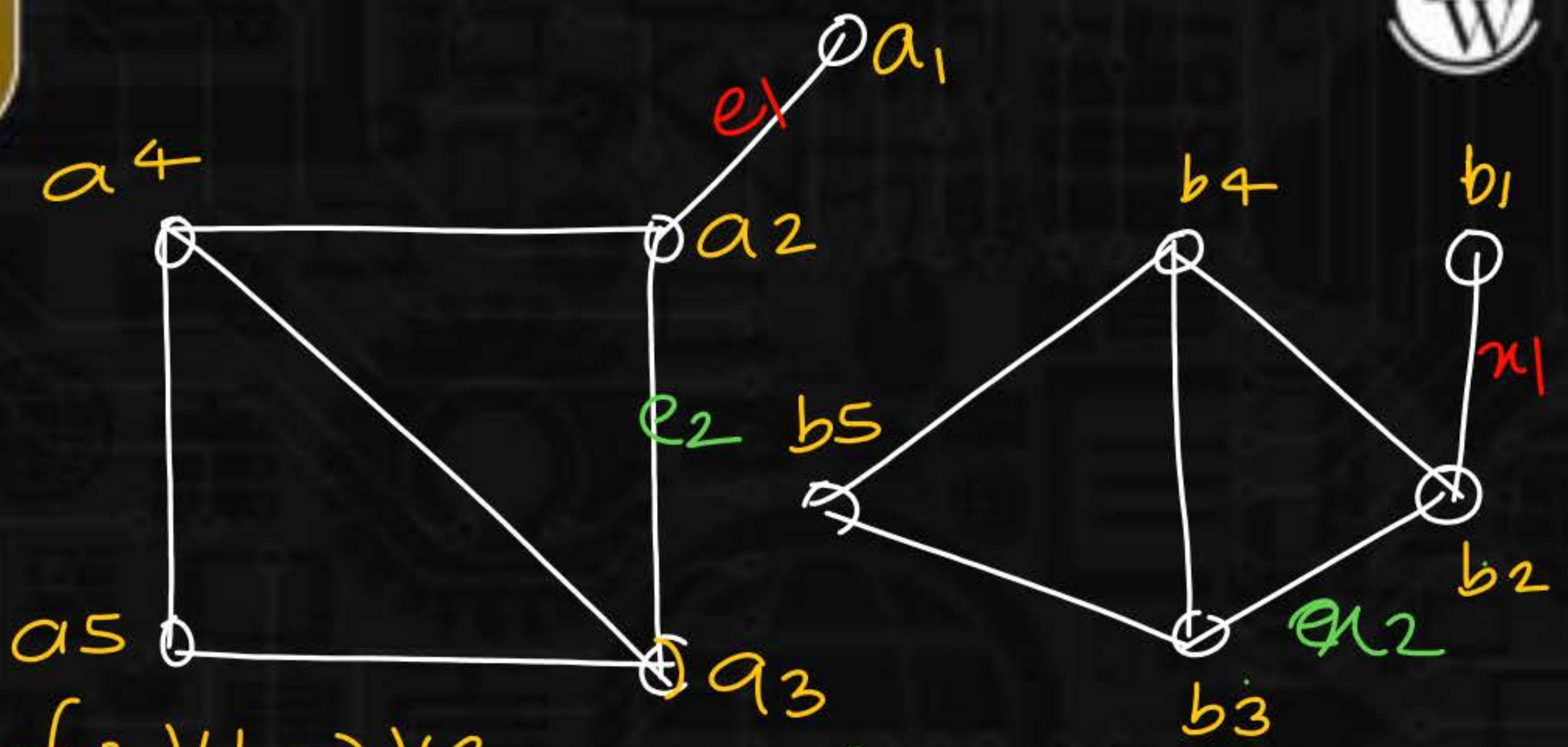




Types of graph

$G_1(V_1, E_1, \psi_1)$

$G_2(V_2, E_2, \psi_2)$



$1:1C \begin{cases} f: G_1 \rightarrow G_2 \\ f: V_1 \rightarrow V_2 \\ f: E_1 \rightarrow E_2 \\ f: \psi_1 \rightarrow \psi_2 \end{cases}$

$f: V_1 \rightarrow V_2$

$a_1 \rightarrow b_1$

$a_2 \rightarrow b_2$

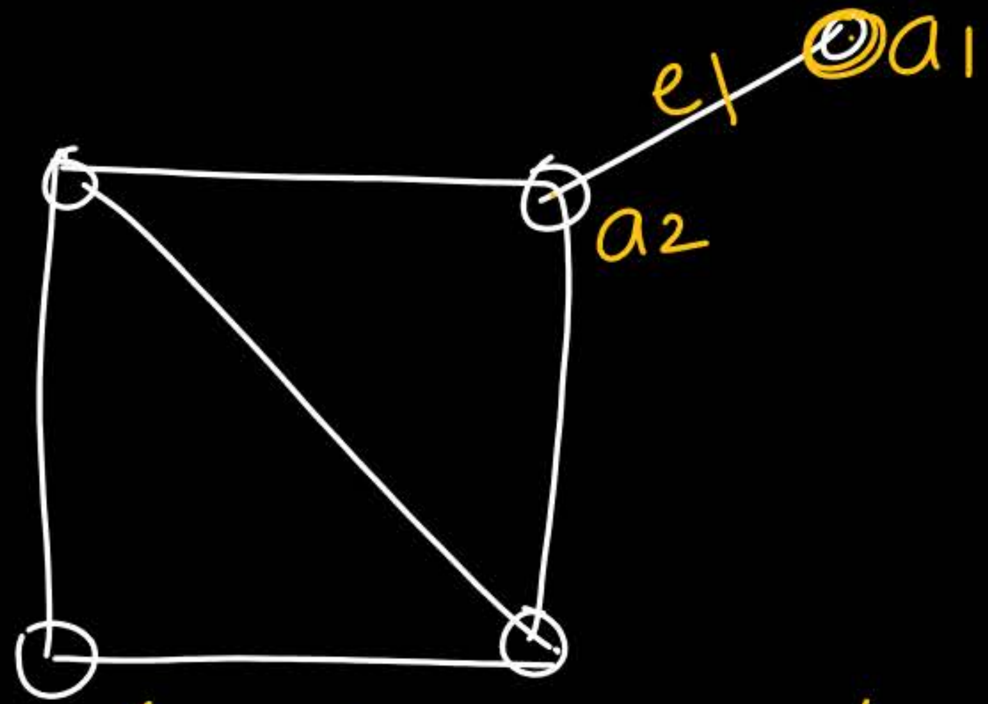
$e_1 \rightarrow (a_1, a_2)$ b_1

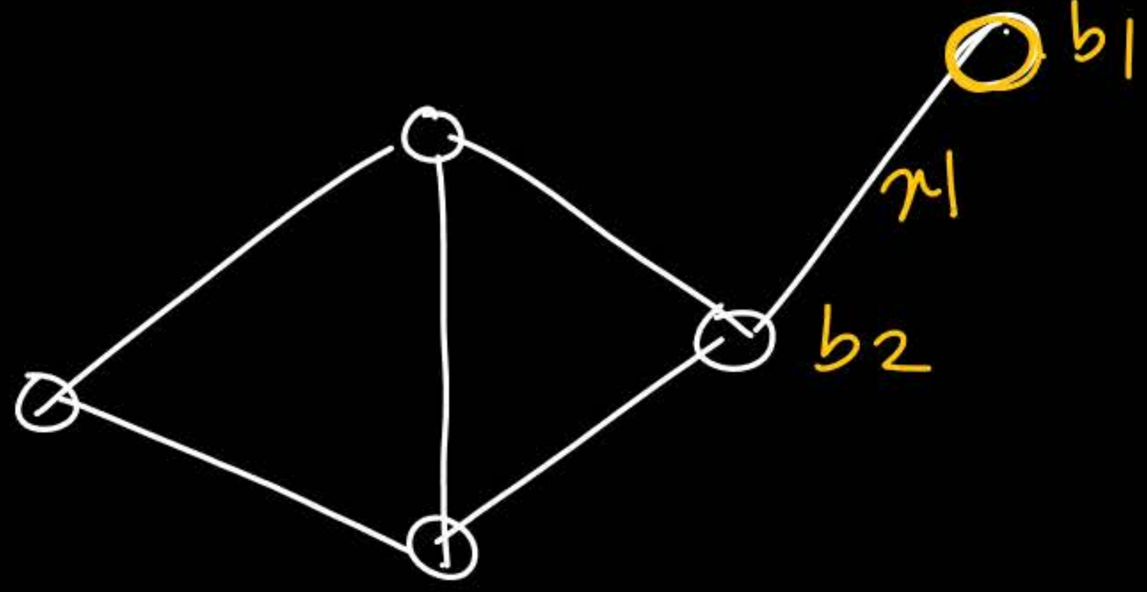
$x_1 \rightarrow (b_1, b_2)$

$f: E_1 \rightarrow E_2$

$e_1 \rightarrow x_1$

$e_2 \rightarrow x_2$





$f: V_1 \to V_2$

$a_1 \to b_1$

$a_2 \to b_2$

$f: E_1 \to E_2$

$e_1 \to x_1$

$f: \psi_1 \to \psi_2$

$e_1 \to (a_1, a_2)$

$x_1 \to (b_1 \;\; b_2)$

Types of graph

Consider a graph, verten which is represented as n-bit signal

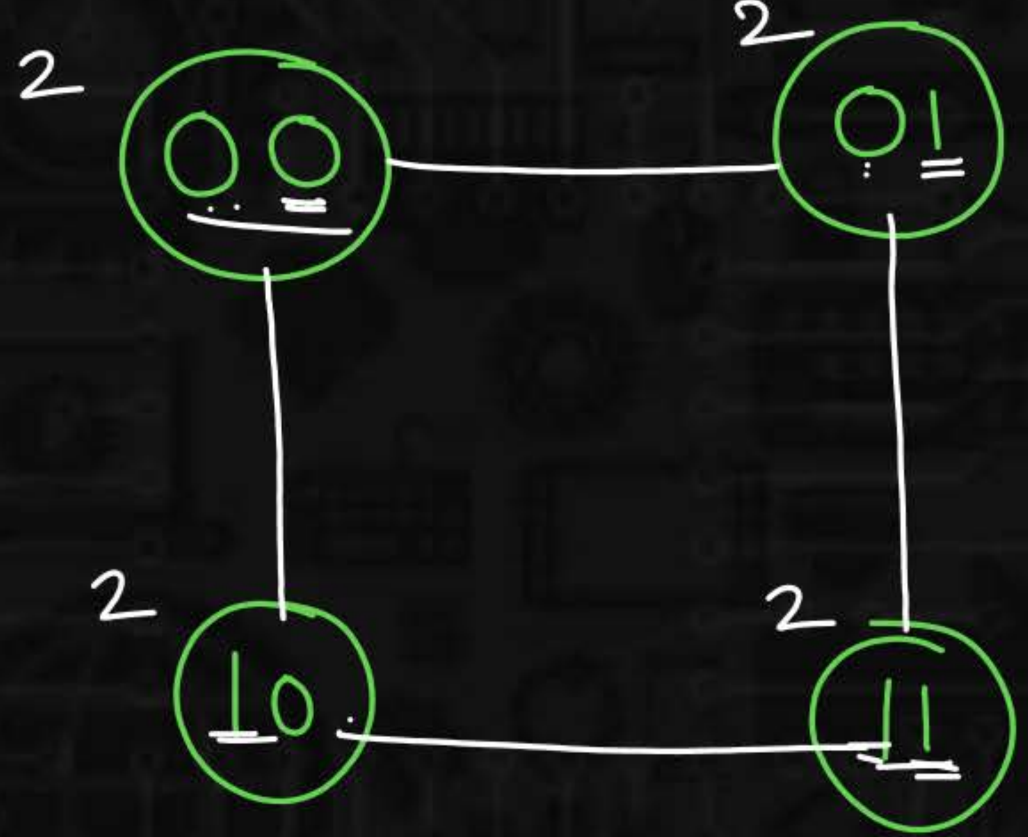
Two vertices are connected, if bit-position changes by 1-bit ?

What will be edges in G.

Types of graph

$n = 2$ (bit)

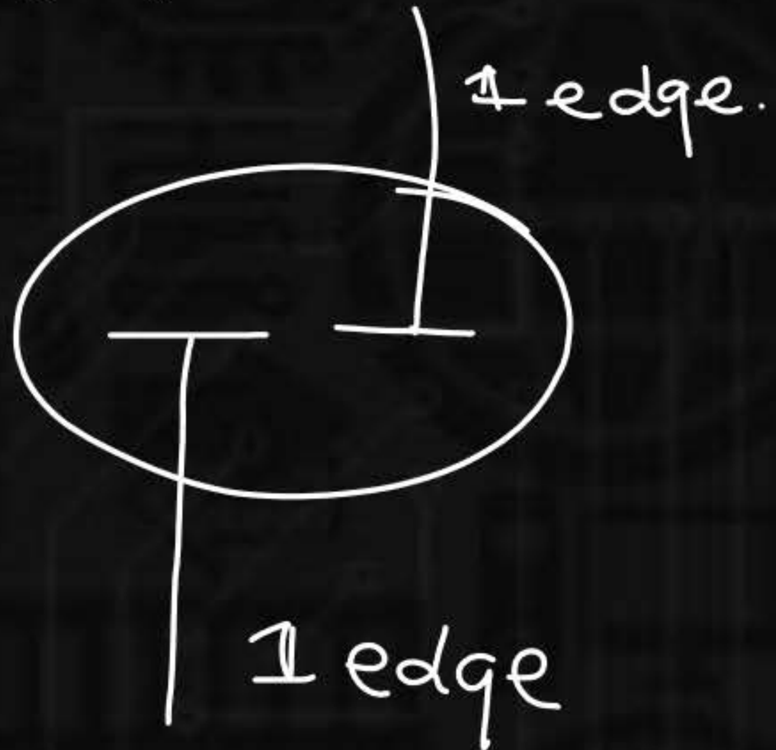
Total vertices = 4.



$e = ?$

$n = 2$

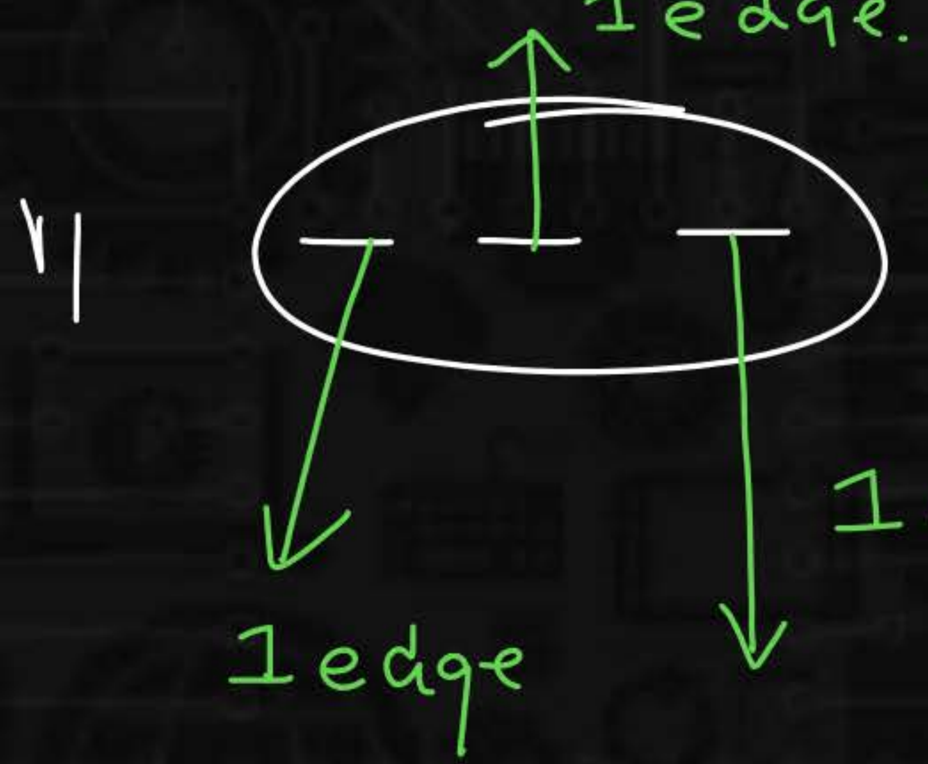
Total vertices $= 2^2 = 4$.



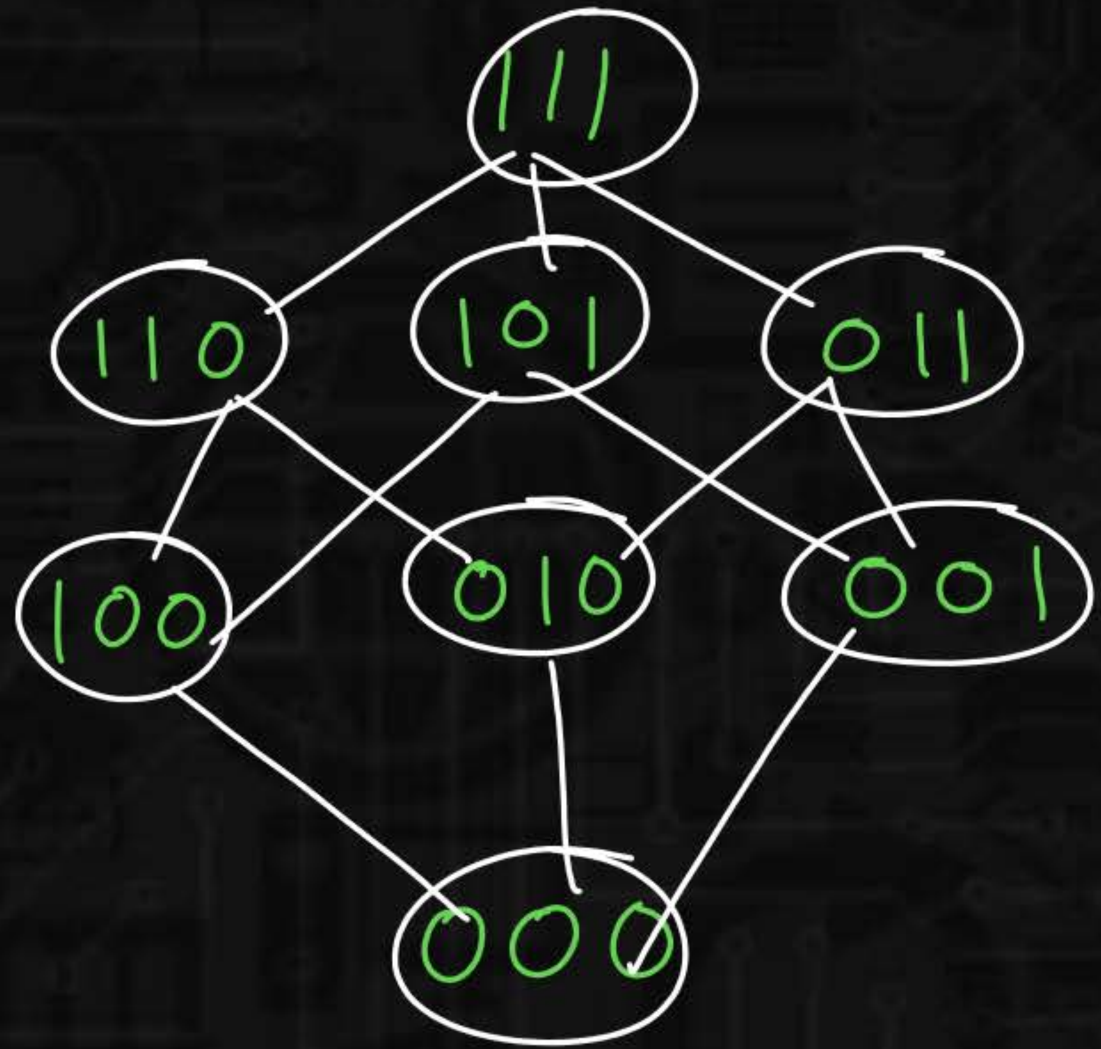
Types of graph

$n = 3$ (bit signal)

Total vertices $= 2^3 = 8$



Degree of each vertex is 3.



Types of graph

n- bit signal.

Total vertices = $2^n = v$

Degree of each vertex = n.

$$\sum d(v_i) = 2e$$

$$2^n \times n = 2e$$

$$e = \frac{n \times 2^n}{2}$$

$$\sum d(v_i) = 2e.$$

$$2^n \times n = 2e$$

$$e = n \times \frac{2^n}{2}$$

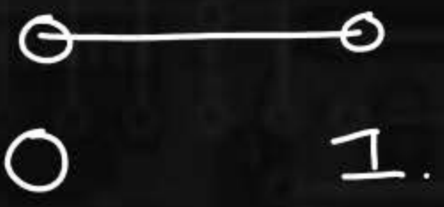
$$e = n \times 2^{n-1}.$$

Types of graph

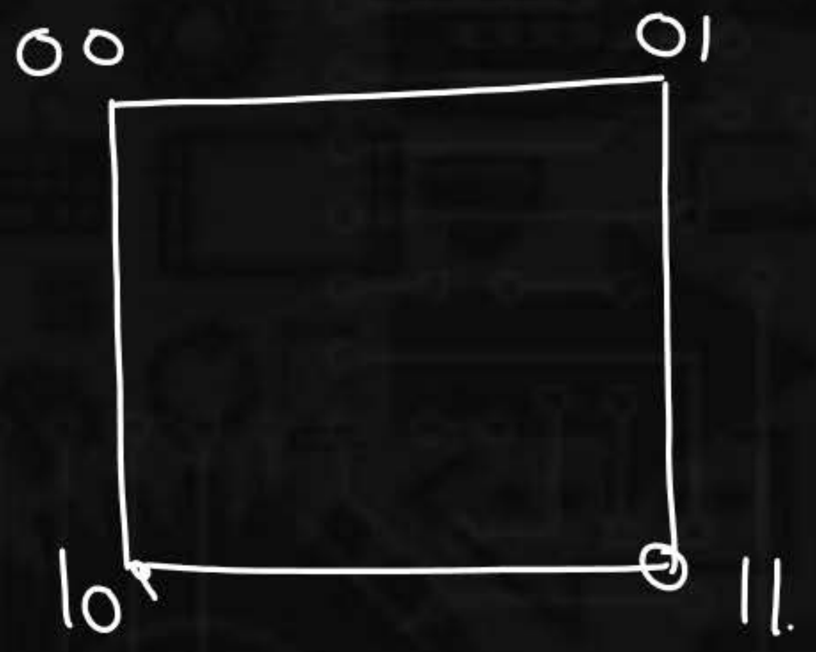
Hypercube (Q_n)

↳ n bit signal.

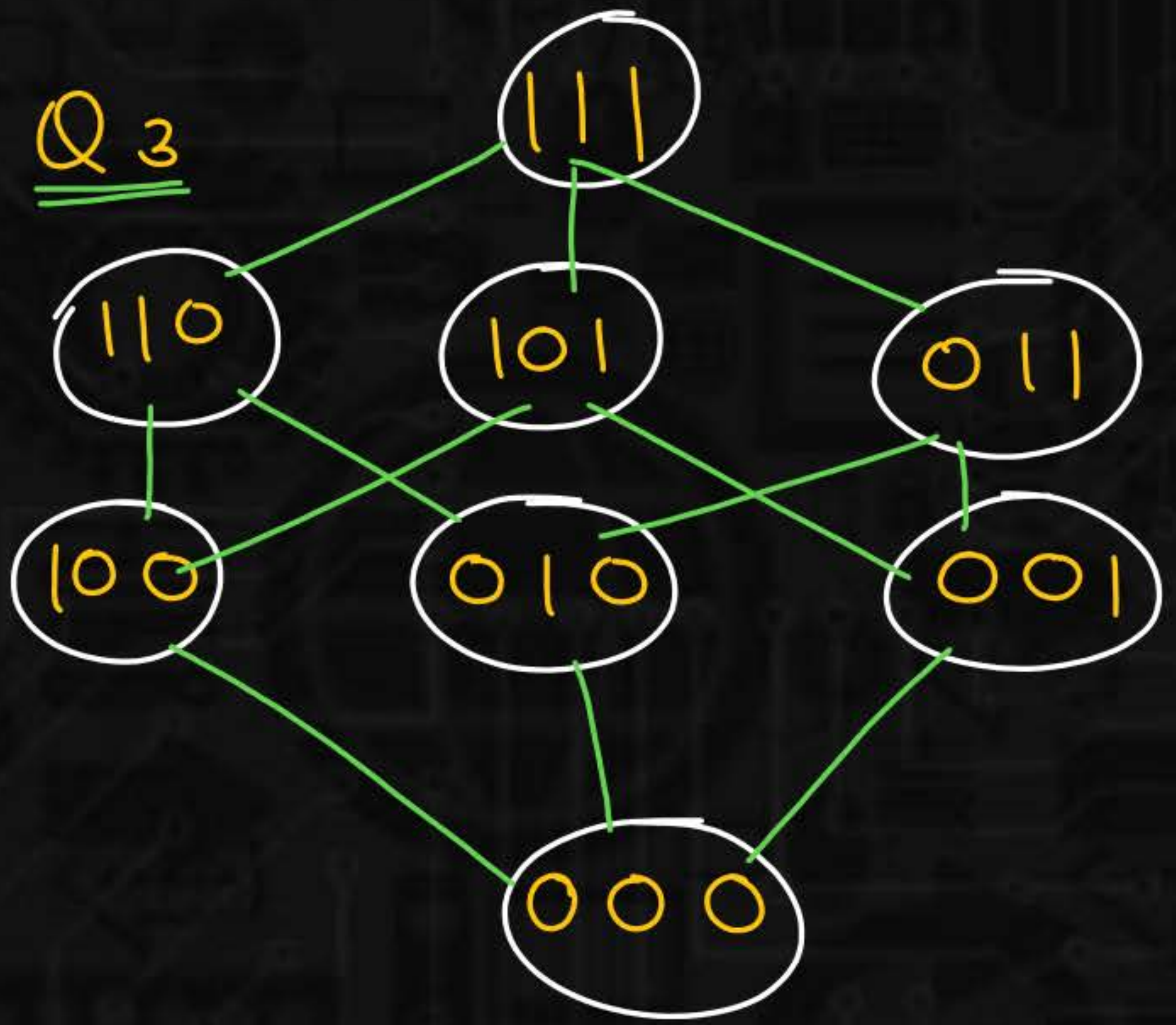
Q1



Q2



Q3



n-bit signal.

Total vertices $= 2^n = v$

Degrees of all vertices $= n$.

K_{2^n} $\quad 2^n-1 \quad 2^n-1 \quad 2^n-1$.

Total vertices $= 2^n$.

$G \rightarrow \underbrace{n \quad n \quad n \quad \cdots \quad n}$.

$\bar{G}$ $\quad 2^n-1-n, \quad 2^n-1-n, \quad 2^n-1-n.$

$$e(G) = n \cdot 2^{n-1}.$$

$$e(G) + e(\overline{G}) = \frac{v(v-1)}{2} = \frac{2^n(2^n-1)}{2}$$

$$n \cdot 2^{n-1} + e(\overline{G}) = \frac{2^n(2^n-1)}{2}.$$

$$e(\overline{G}) = \frac{2^n(2^n-1)}{2} - n \cdot 2^{n-1}.$$


THANK YOU GW
SOLDIERS !