08.10.19

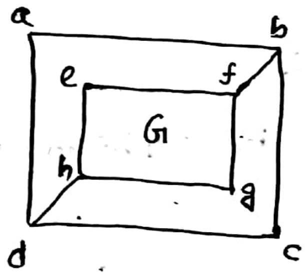
Isomorphism in graph :

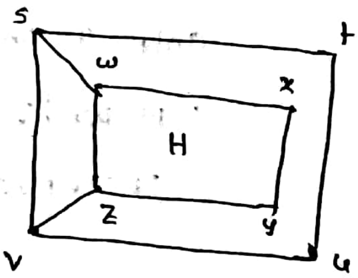
Def^n - same no of elements despite different structure

* A property preserved by graph isomorphism ⟶ graph variant

Identifying isomorphic graphs —

1. same no of vertices
2. same no of edges
3. same no of vertices with same degree





1. $|V_G| = |V_H| = 8$
2. $|E_G| = |E_H| = 10$
3.

	G	H
(deg 2)	4	4
(deg 3)	4	4

4. Verification of isomorphism function

Scanned by CamScanner

Adjacency Matrix :

	a	b	c	d	e	f	g	h
a	0	1	0	1	0	0	0	0
b	1	0	1	0	0	1	0	0
c	0	1	0	1	0	0	0	0
d	1	0	1	0	0	0	0	0
e	0	0	0	0	0	1	0	1
f	0	1	0	0	1	0	1	0
g	0	0	0	0	0	1	0	1
h	0	0	1	0	1	0	1	0

	s	t	u	v	w	x	y	z
s	0	1	0	1	1	0	0	0
t	1	0	1	0	0	0	0	0
u	0	1	0	1	0	0	0	0
v	1	0	1	0	0	0	0	0
w	1	0	0	0	0	1	0	1
x	0	0	0	0	1	0	1	0
y	0	0	0	0	0	1	0	1
z	0	0	0	1	1	0	1	0

$c \rightarrow d$

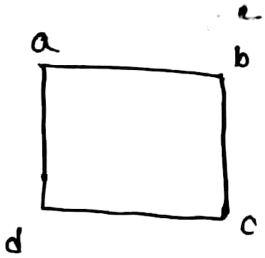
$d \rightarrow v$

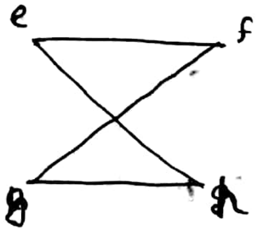
$h \rightarrow z$

$g \rightarrow y$

only 4 similarities

∴ properties of isomorphism is not preserved.





	a	b	c	d
a	0	1	0	1
b	1	0	1	0
c	0	1	0	1
d	1	0	1	0

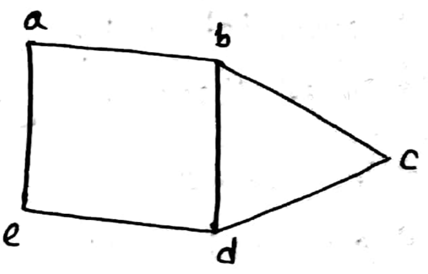
	e	f	g	h
e	0	1	0	1
f	1	0	1	0
g	0	1	0	1
h	1	0	1	0

Connectivity :

path

simple path

a b c d   b c d



b c d b ⟶ circuit

starts - ends ⟶ same vertex

connected graphs ⟶ undirected

Directed

- ⟶ strongly con
- ⟶ weakly con

Euler - Hamilton paths & ckt

E H ⟶ cover all the vertices

H ⟶ can't repeat vertices

E ⟶ can't " edges

Quiz

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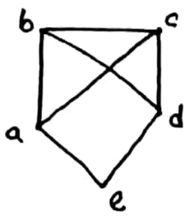
Theorems related to Euler — paths (EP) / circuits (EC)

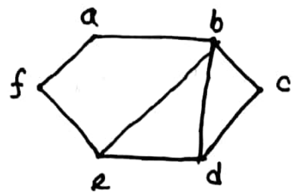
Theorem - 1 :

A connected multigraph has an Euler path and no EC if and only if there are exactly two vertices of odd degree.

Theorem - 2 :

A connected multigraph with at least two vertices has an EC if and only if each ~~vertices~~ vertex has even degree.





Hamiton — Path (HP) / circuit (HC)

Dirac's Theorem :

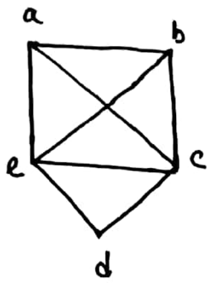
If G is a simple graph with n vertices where $n \geq 3$ such that the degree of each vertex is at least $\lfloor n/2 \rfloor$, then G has HC.

Ore's Theorem :

If G is a simple graph with n vertices where $n \geq 3$ such that for every pair of non-adjacent vertices (u, v)

$$\deg(u) + \deg(v) \geq n$$

is true, then G has HC



$n = 5$

$\lfloor n/2 \rfloor = 2$

$$\left.\begin{array}{l} a \rightarrow 3 \\ b \rightarrow 3 \\ c \rightarrow 4 \\ d \rightarrow 2 \\ e \rightarrow 4 \end{array}\right\} \geq 2$$

$\underline{(a, d)}$

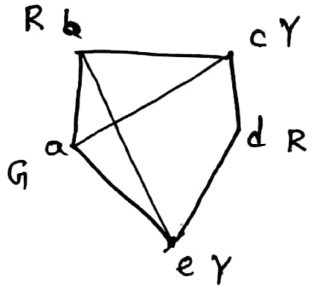
$3+2 \geq 5$

$\underline{(b, d)}$

$3+2 \geq 5$

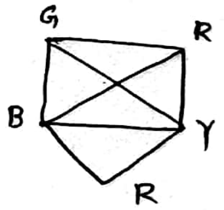
Chromatic No:

The min^m number of colors needed to color the vertices of a graph such that no two adjacent vertices have the same color.



non-connected : $\{b, d\}$ $\{a, d\}$ $\{c, e\}$

$\chi(G) = 3$



$\chi(\sim) = 4$