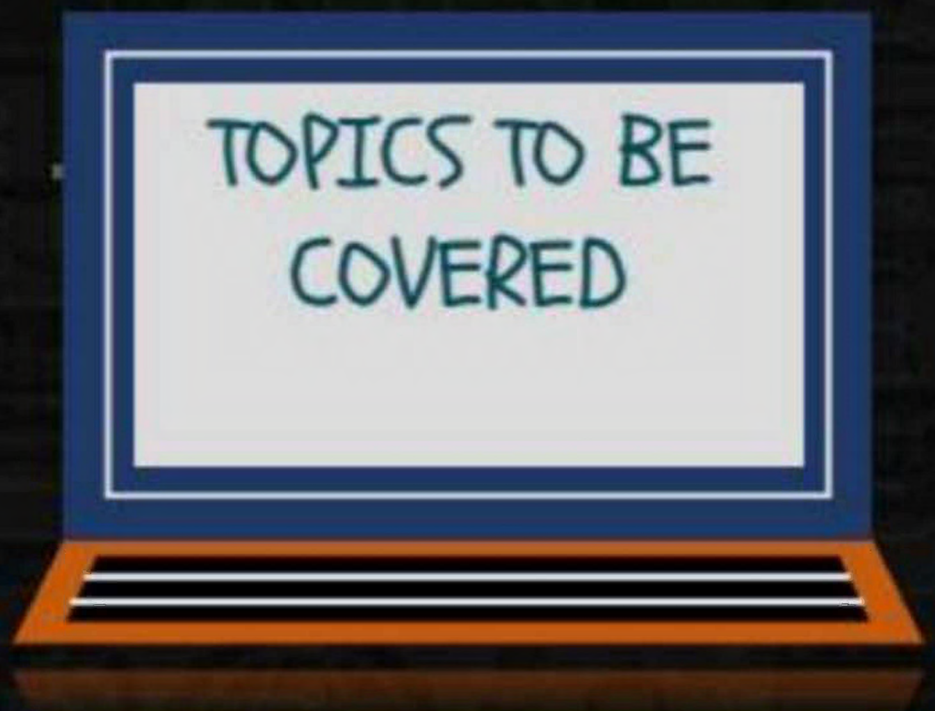
CS & IT ENGINEERING

Graph Theory

Connectivity in Graphs part -03

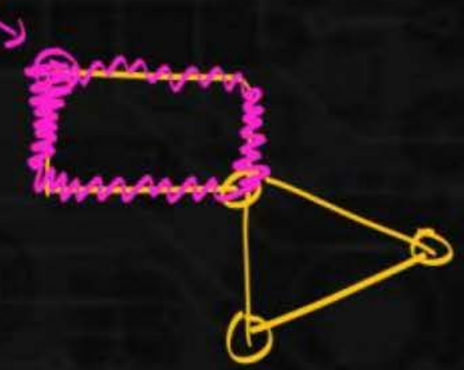
Lecture No. 08

By- SATISH YADAV SIR



Connectivity in Graphs

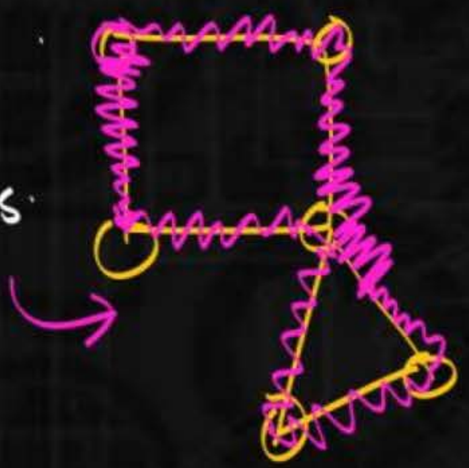
Connectivity in Graphs



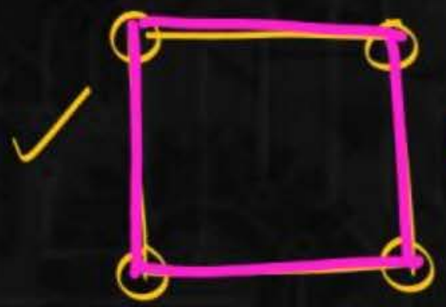
Trail :

Closed Trail : Trail + starting = ending vertices

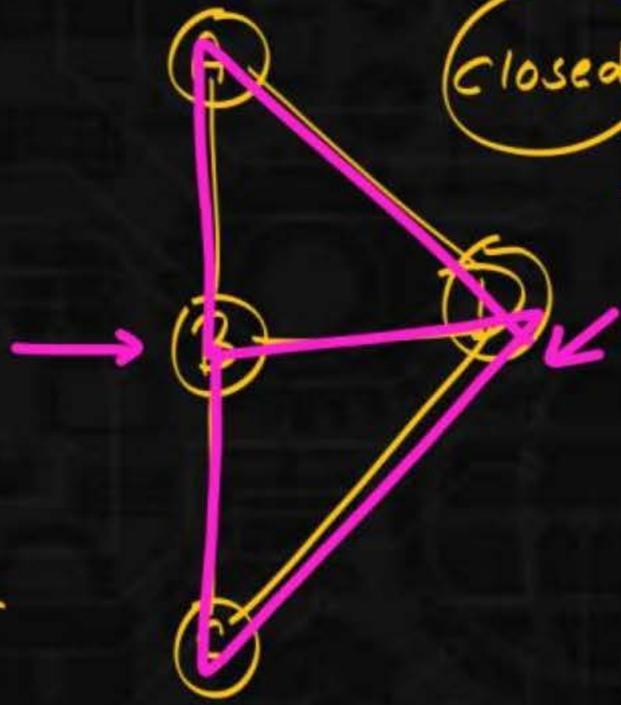
Euler circuit : Closed Trail + cover all edges



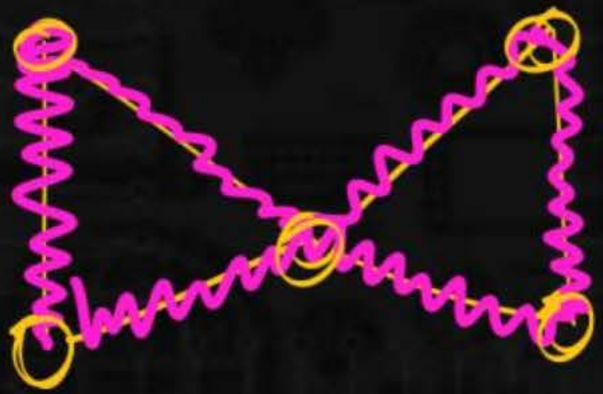
Connectivity in Graphs



closed.
all edges ✓
Euler Graph ✓

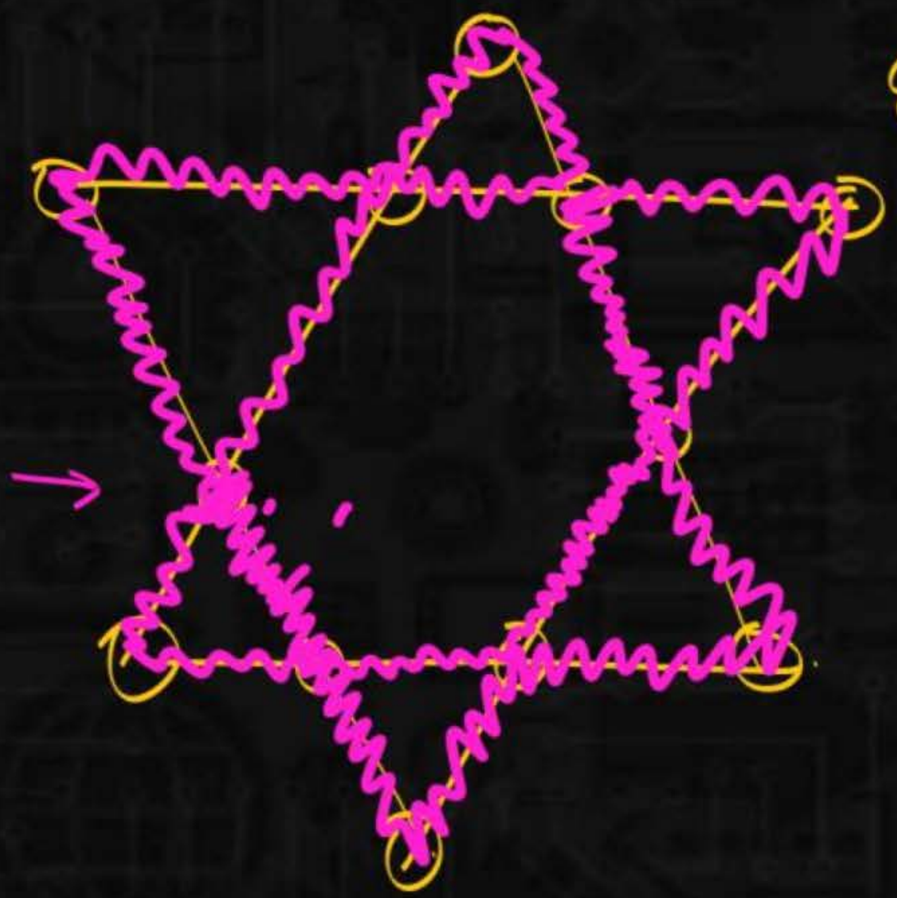


closed A
→ all bridges
all covering edges.



1 e1 2 e3 . . .
Euler circuit ✓
Euler Graph ✓
G1 = (V, E)

Connectivity in Graphs



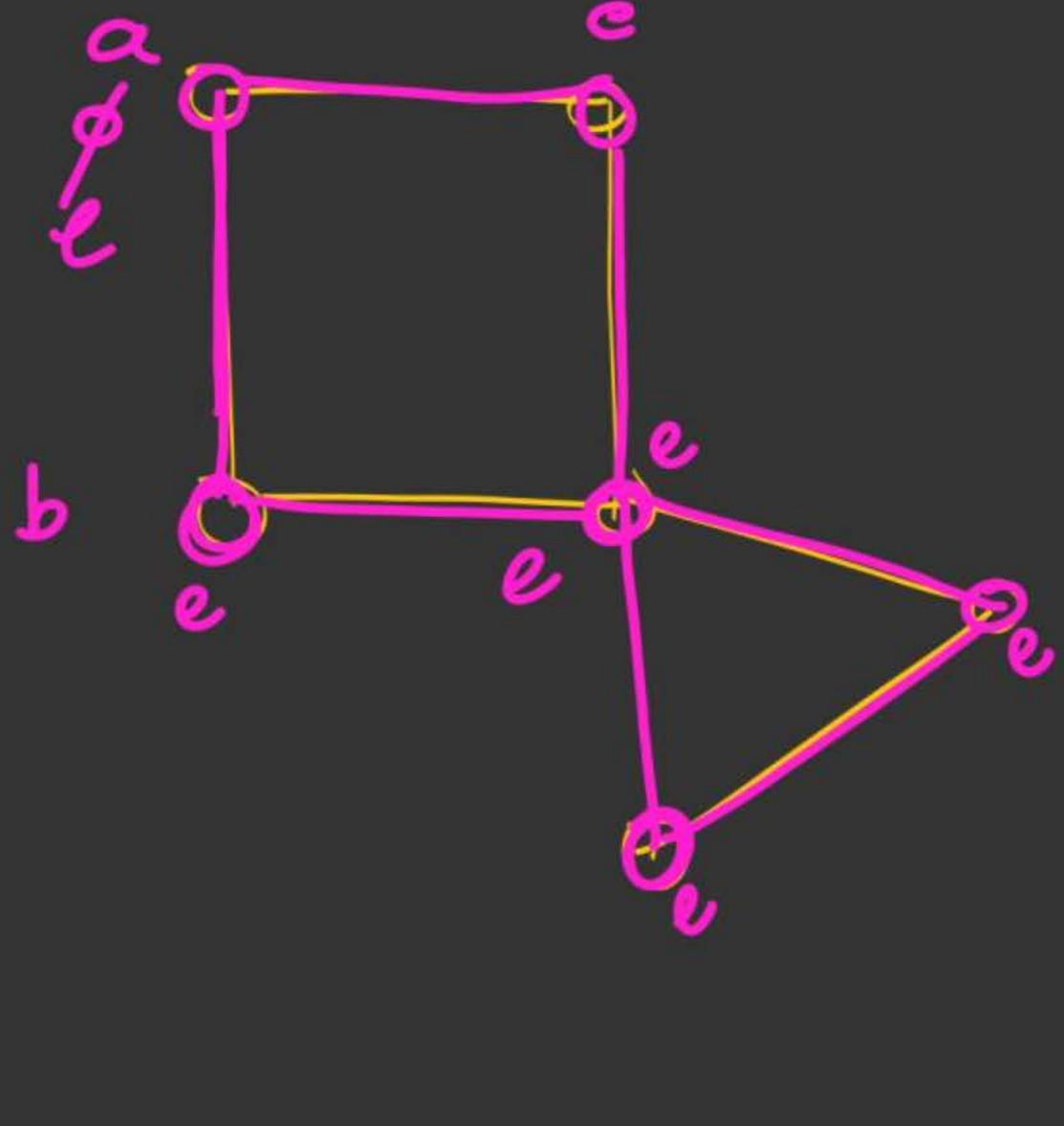
Euler Graph.

Connectivity in Graphs

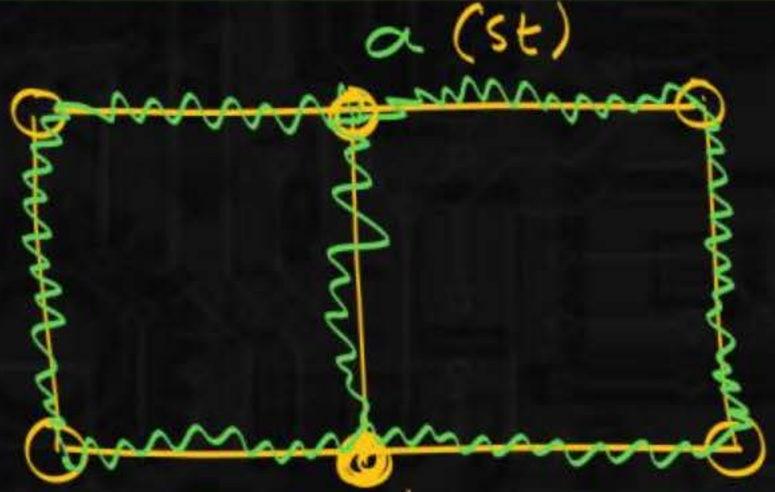
Thm: Graph is Euler Graph if and only if degrees of all vertices are even. (connected)

{Closed.
all edges

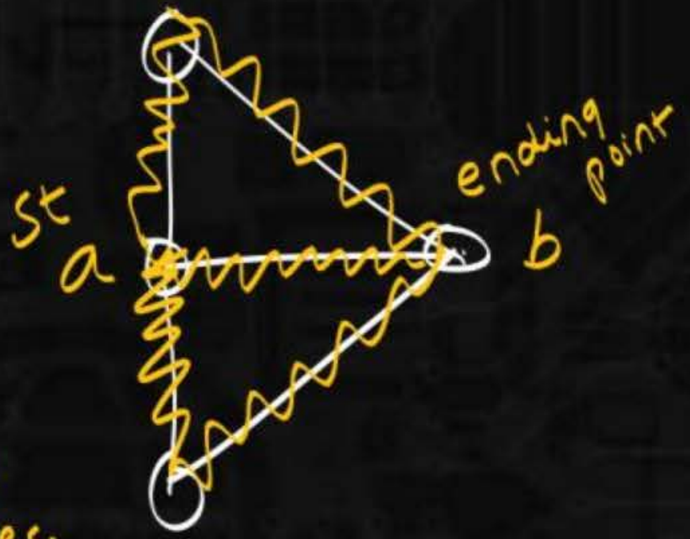
Starting point = a.


a
c
e
b
e
e
e
e
e
e

Connectivity in Graphs



not Euler Graph.



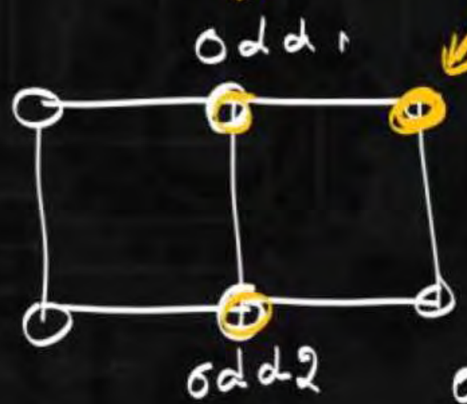
Trail:

open Trail: st ≠ ending vertices.

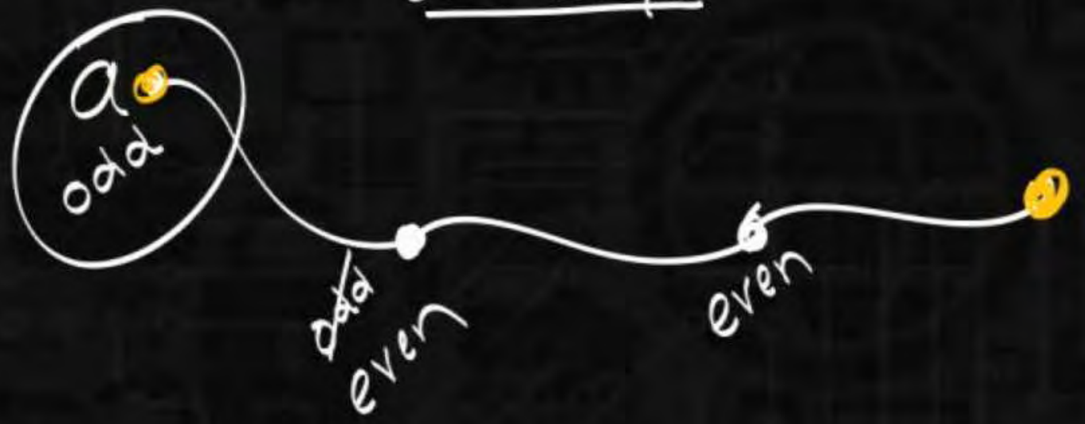
Eulerline/ Euler path: open Trail + all edges exactly once.

Connectivity in Graphs

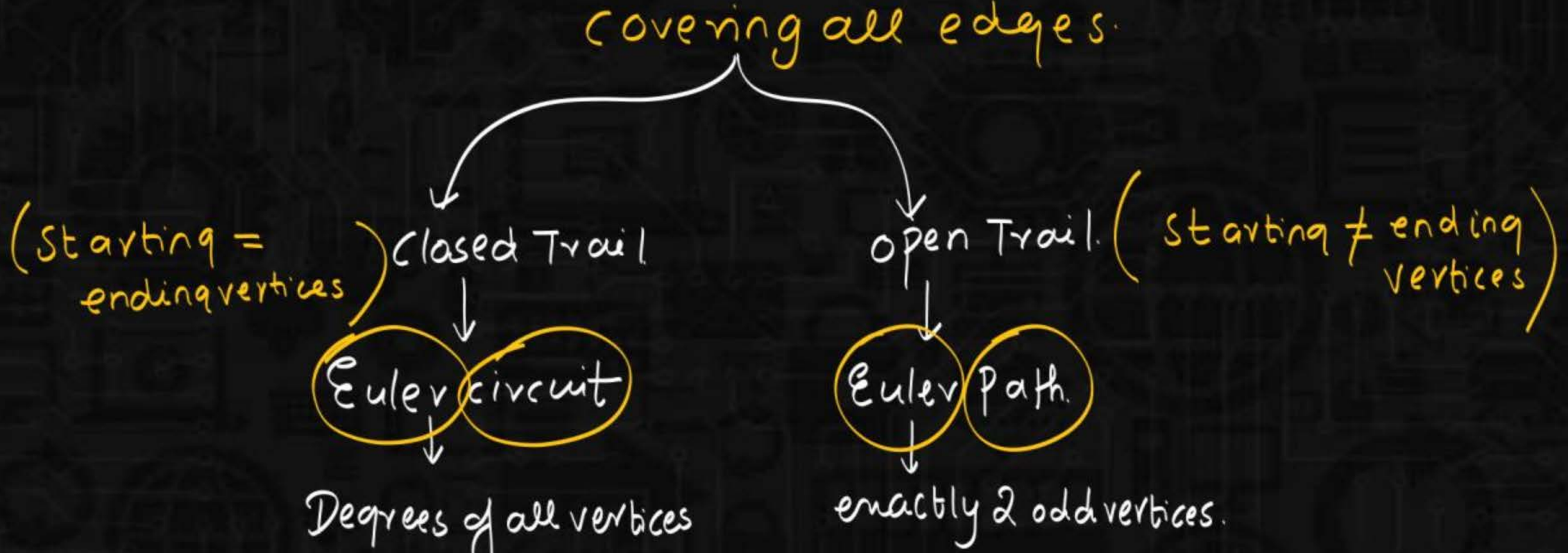
Thm: Graph contains Euler path if and only if it contains exactly 2 odd vertices.



all edges



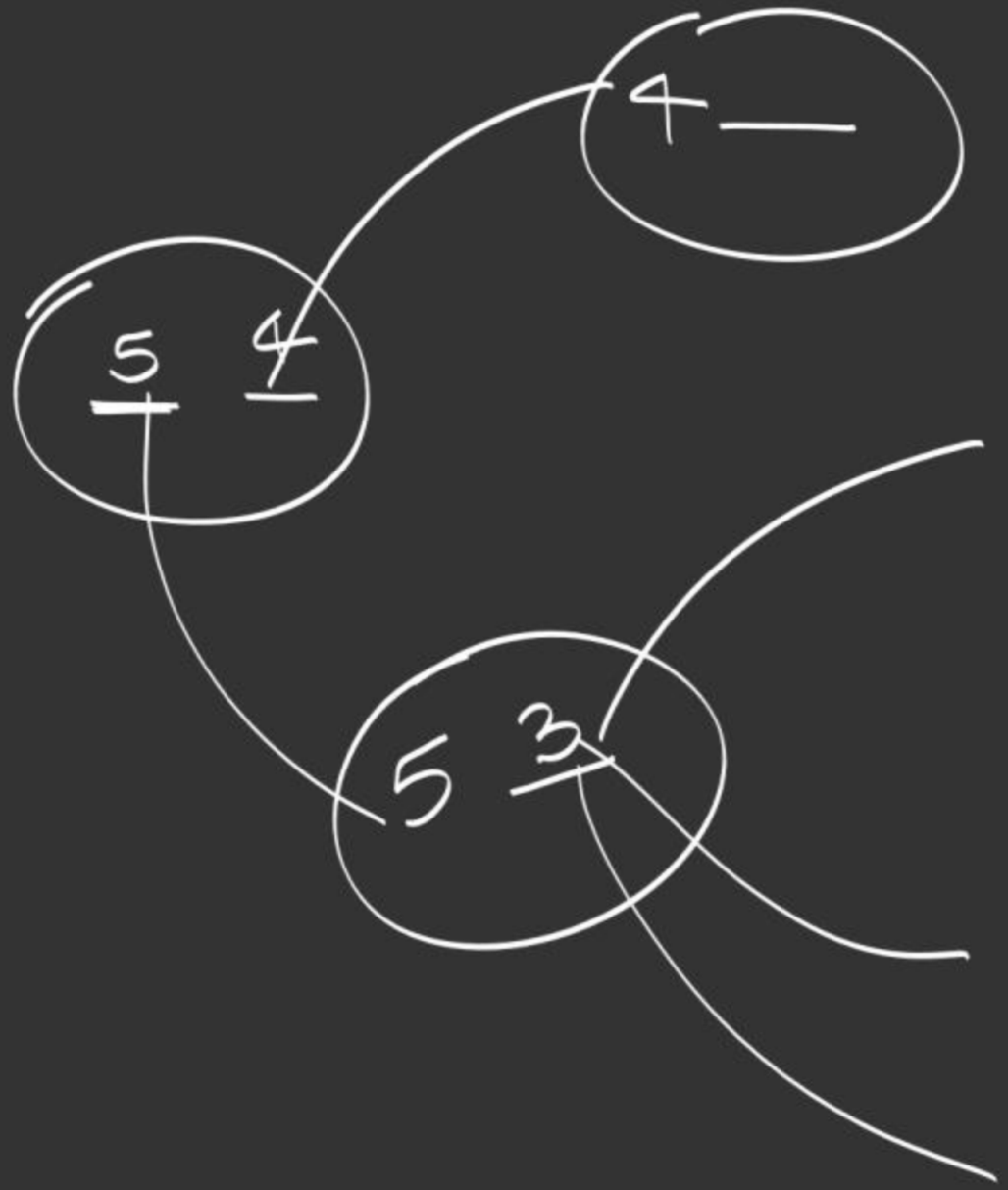
Connectivity in Graphs



Connectivity in Graphs

(+) Line Graph of euler Graph will always be Euler Graph.

all degrees are even


4
5
4
5
3

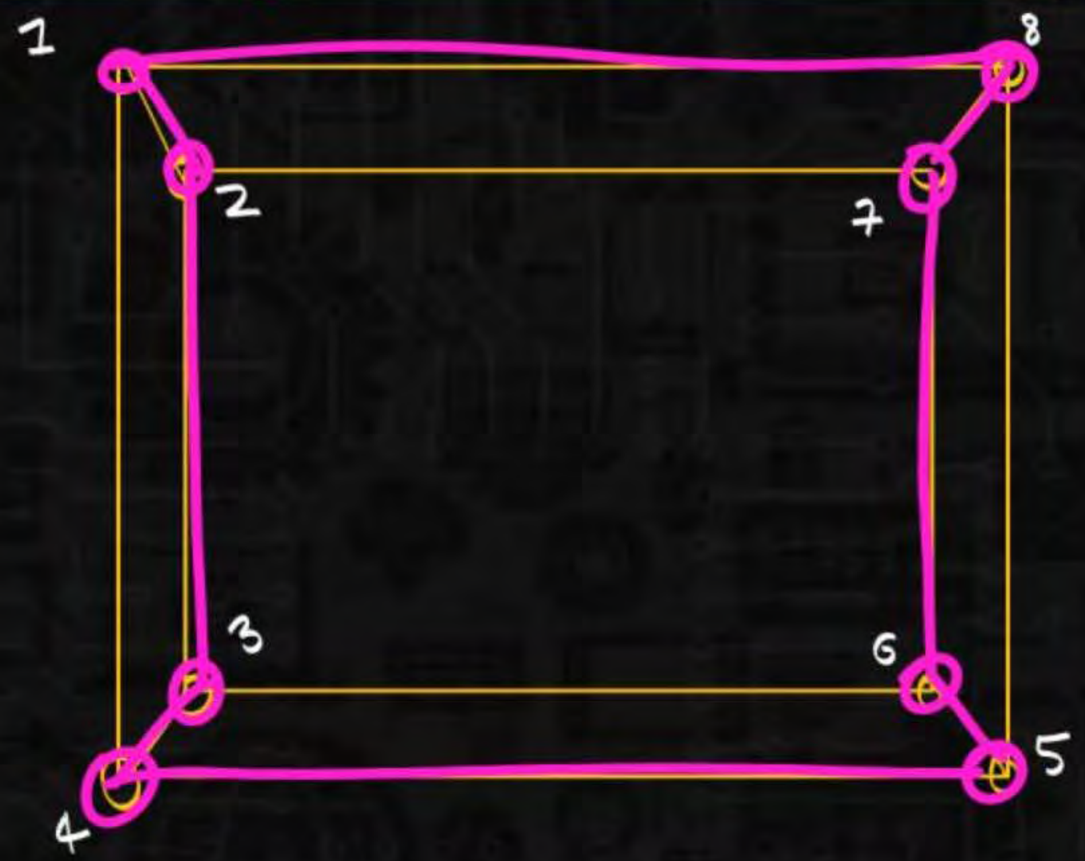
Connectivity in Graphs

Path :

Closed Path : Path + st = ending vertices.

Hamiltonian circuit : Closed Path + all vertices exactly once.

Connectivity in Graphs

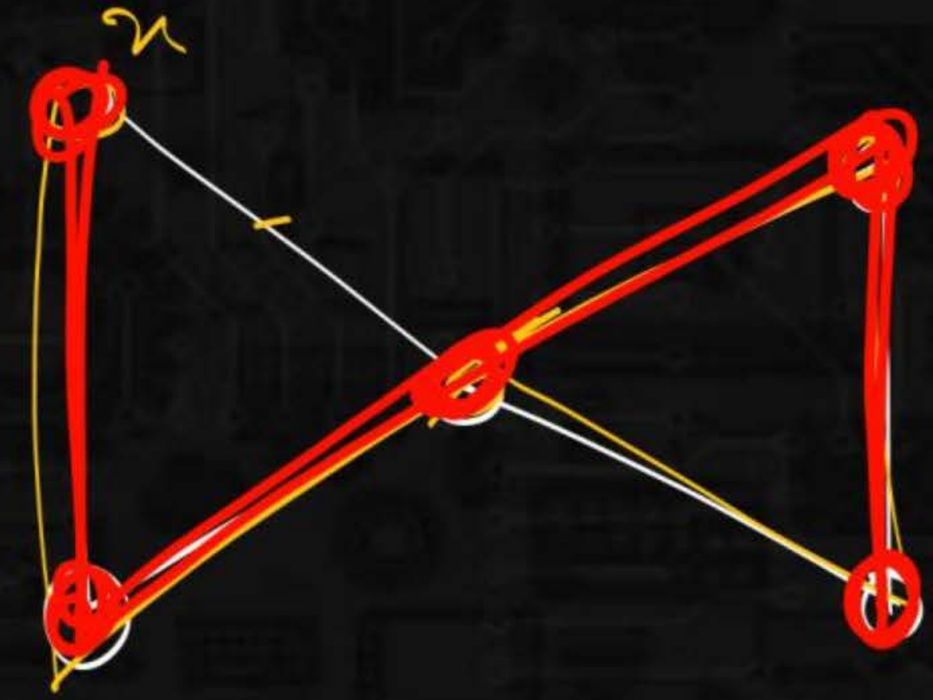


Hamiltonian ckt :

$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 - 5 - 6 - 7 - 8 - 1.$

Graph which contains H.c is Hamiltonian Graph.

Connectivity in Graphs



{ Closed.
all vertices exactly once.

{ open path
+
covers all vertices exactly once.

→ Hamiltonian path. ∴

Connectivity in Graphs

covering all vertices.

Closed path.

↓

Hamiltonian ckt.

open path.

↓

Hamiltonian path

Connectivity in Graphs

Every Hamiltonian circuit contains Hamiltonian Path (True)

Every Hamiltonian Path contains H.C (false) →

Connectivity in Graphs

Line Graph of Euler Graph is also Hamiltonian Graph.

Connectivity in Graphs

All complete Graphs are Hamiltonian Graph. $(n \geq 3)$

all cycle Graphs are Hamiltonian Graphs (True)

all wheel Graphs are Hamiltonian Graphs (True)

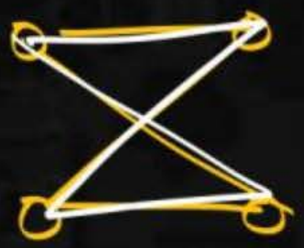
all $K_{m,n}$ are Hamiltonian Graph $(m = n)$ $(m, n \geq 2)$

$K_{1,1}$

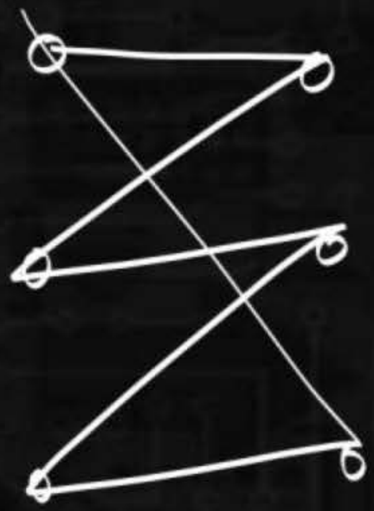
Connectivity in Graphs

all $K_{m,n}$ are Hamiltonian Graph $\left(\begin{matrix} m, n \geq 2 \\ m = n \end{matrix}\right)$

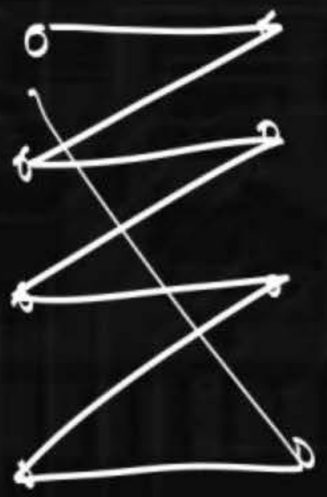
$K_{2,2}$.



$K_{3,3}$.



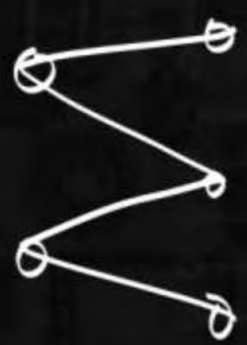
$K_{4,4}$.



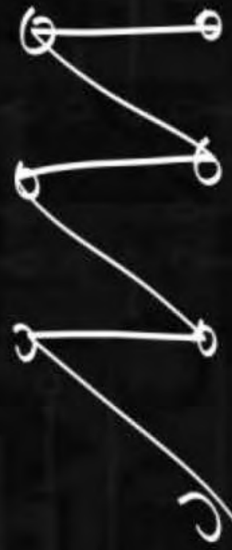
Connectivity in Graphs

all $K_{m,n}$ contains Hamiltonian Path. $(|m-n| \leq 1)$

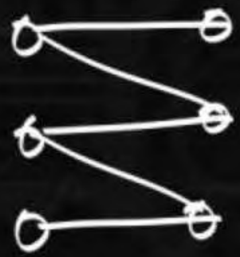
$K_{2,3}$



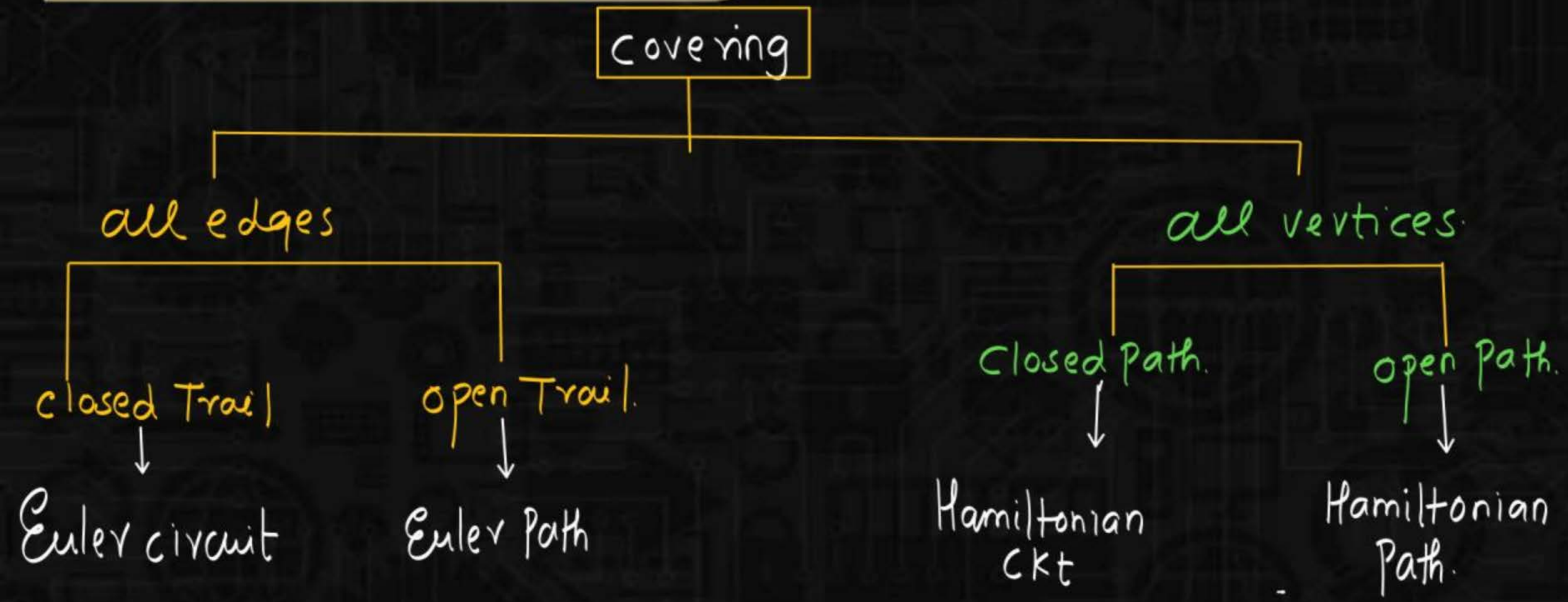
$K_{3,4}$



$K_{3,3}$



Connectivity in Graphs




THANK YOU GW
SOLDIERS !