CS & IT ENGINEERING

Matching no. and covering no.

Lecture No. 11

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TOPICS TO BE COVERED

01 Matching set

02 Maximal matching set

03 Matching no.

04 Covering set

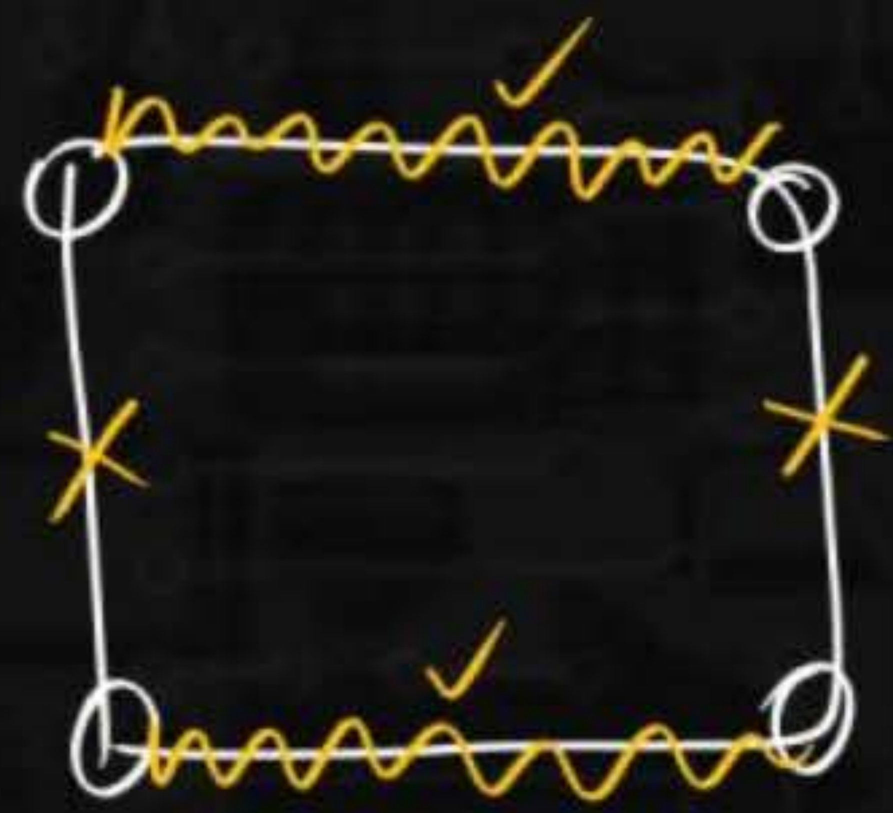
05 Covering number

Independent set:

Set of nonadjacent ~~vertices~~ edges.

Independent edge set :

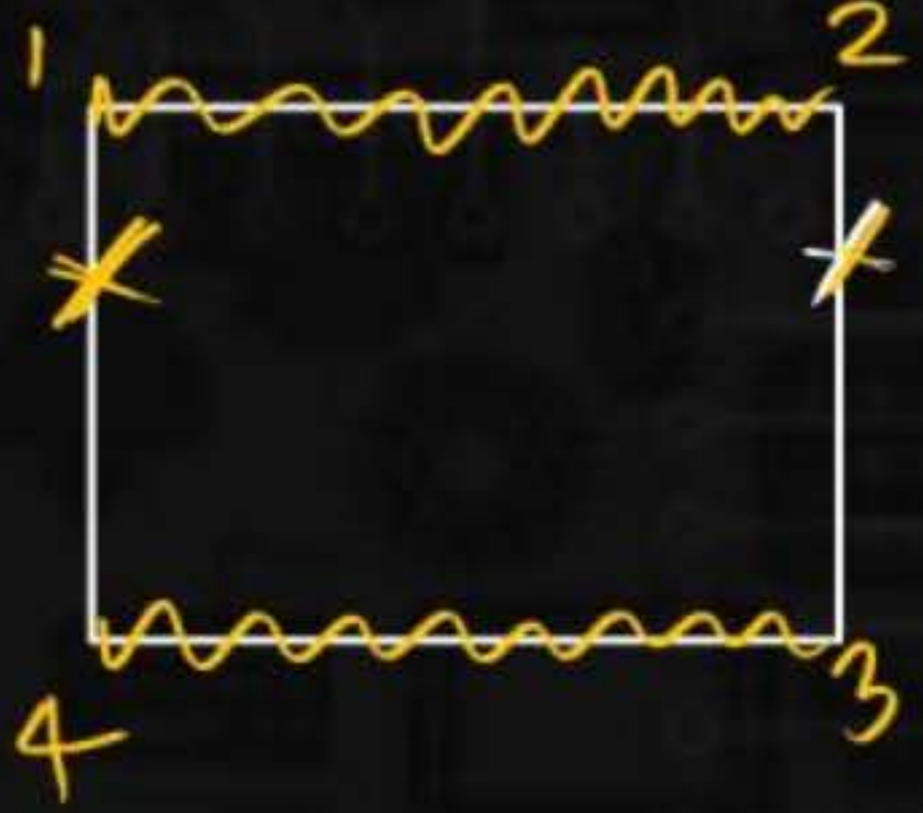
set of non adjacent edges



(Independent edge set)

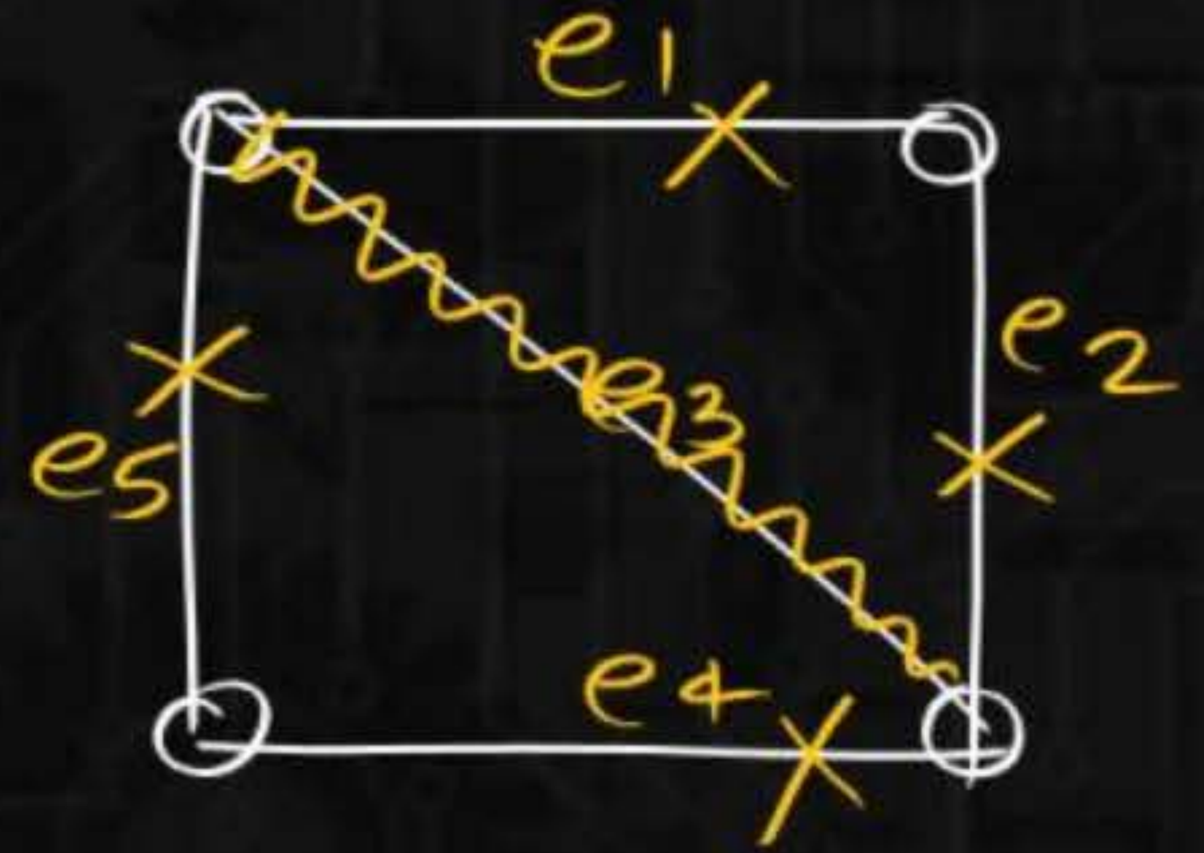
matching set :

Set of non adjacent edges.



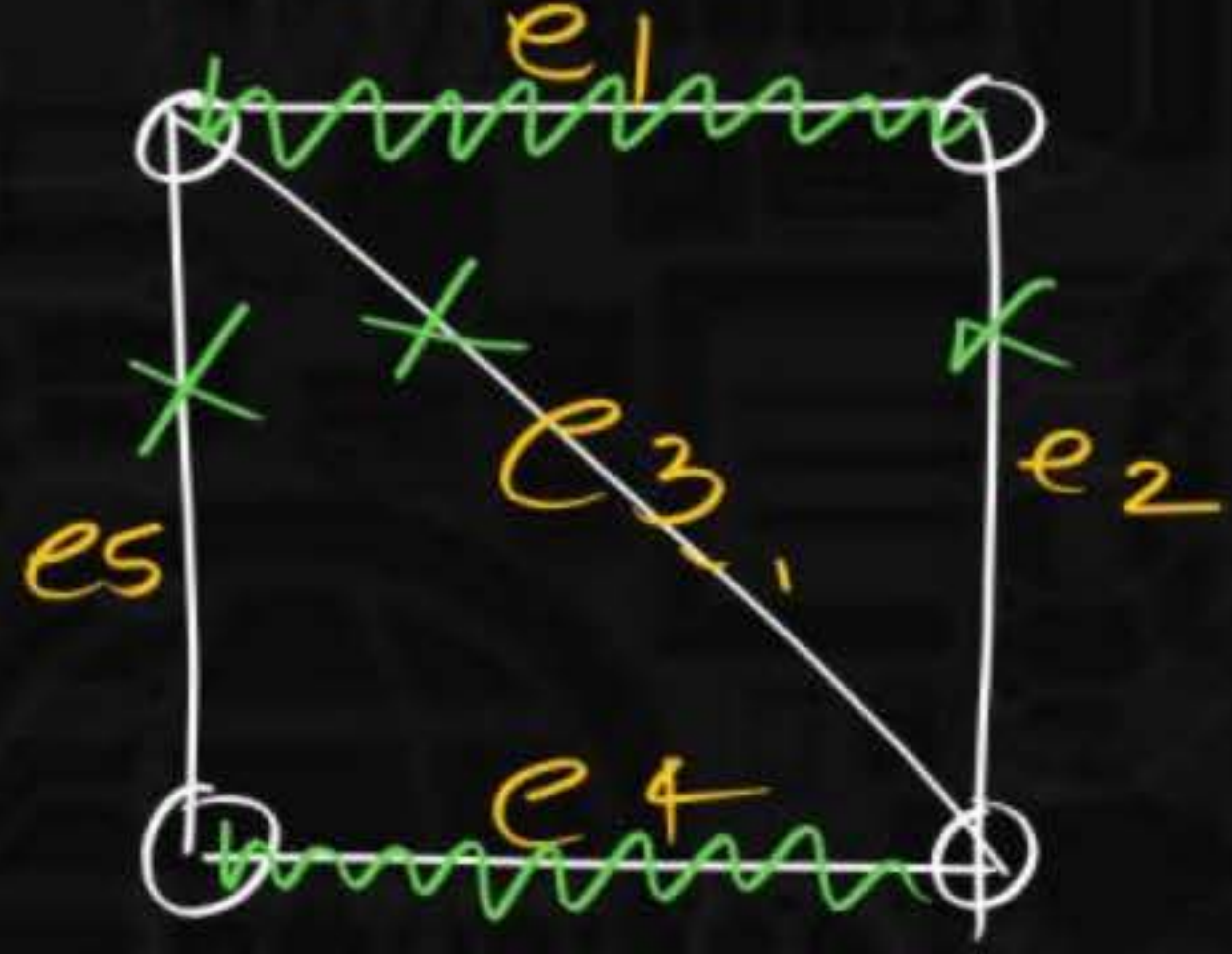
✓ {12} → matching set ✓

✓ {12, 34} → matching set ✓

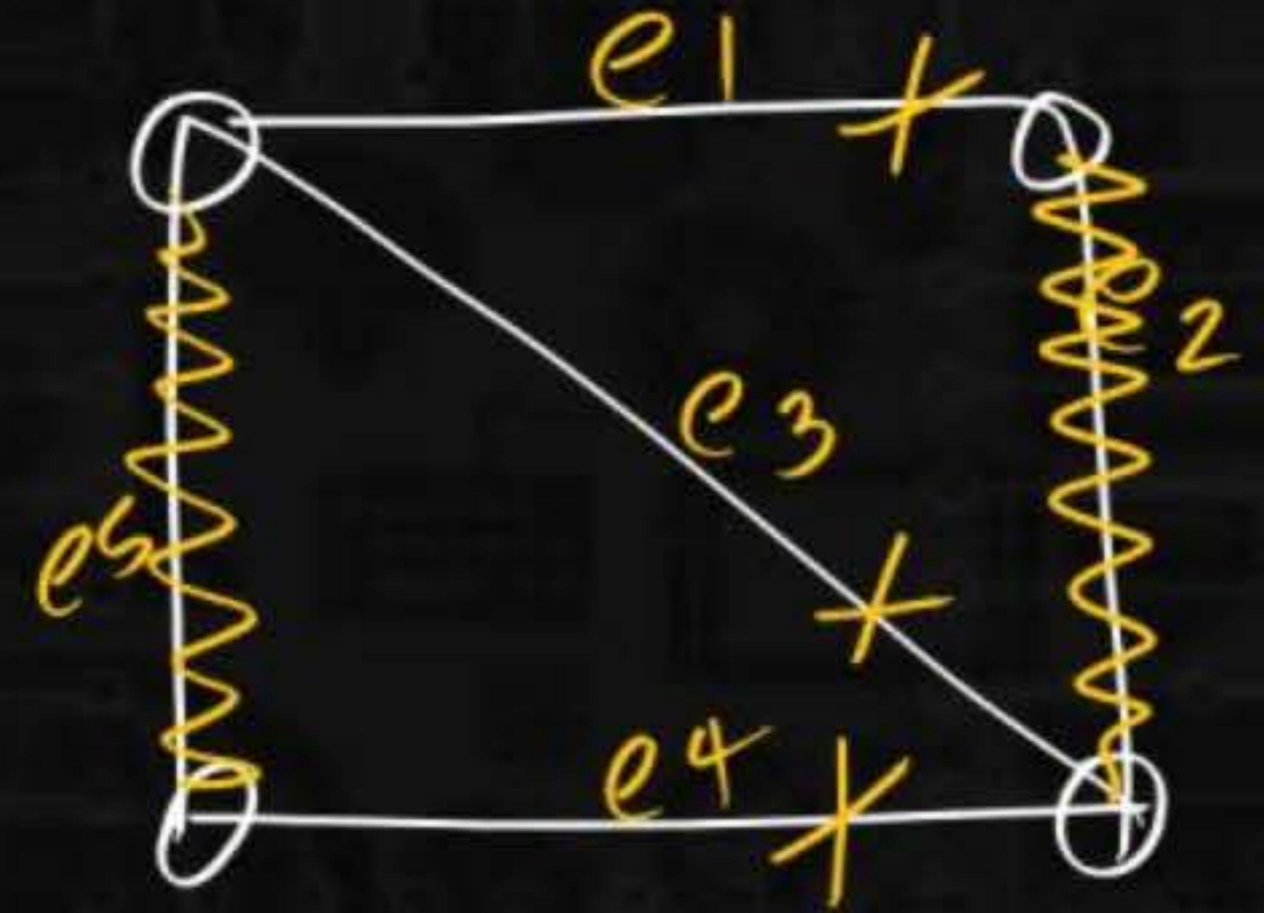


$\{e_3\}$ maximal matching set ✓

$\boxed{M(G) = 2}$



$\{e_2\}$ ms ✓



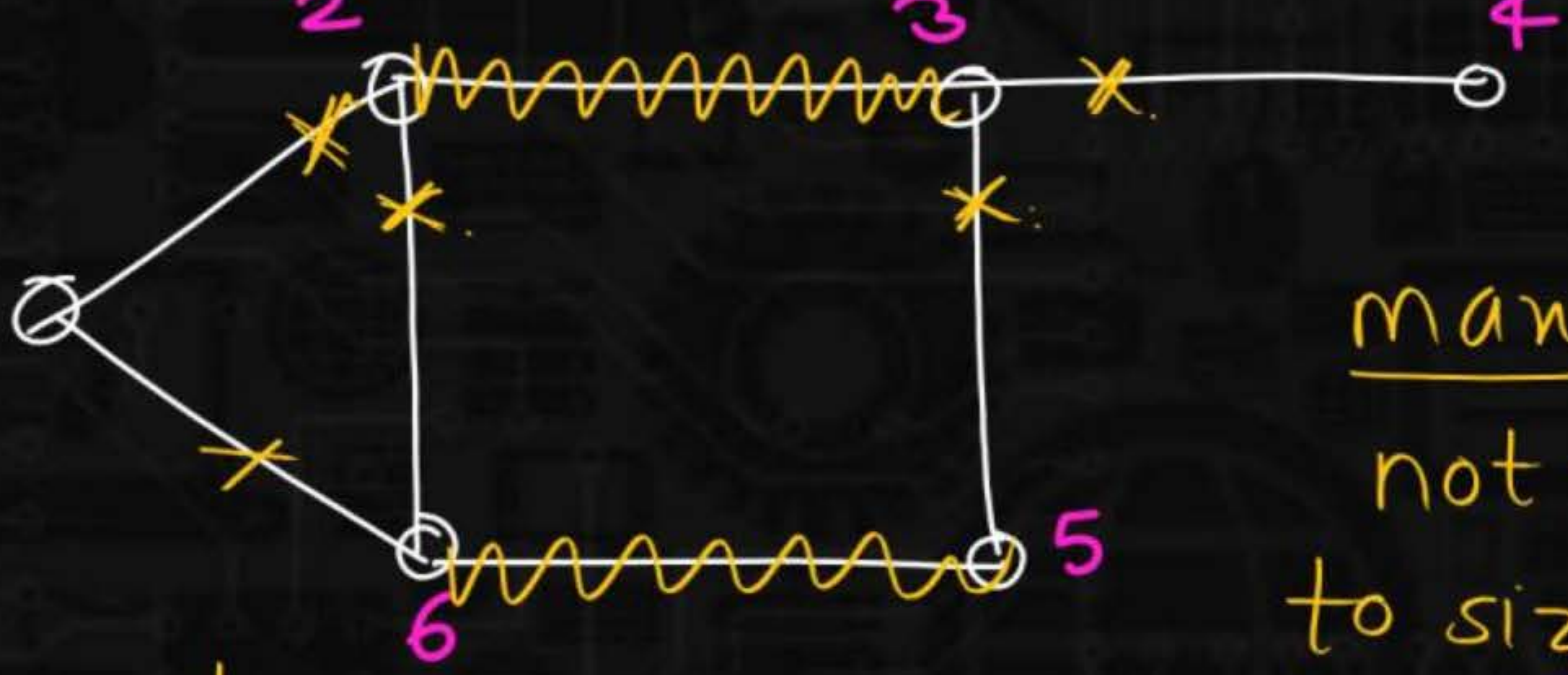
$\{e_2, e_5\}$ mms ✓

$\{e_1\}$ — ms

$\{e_1, e_4\}$ mms

$\{23\}$ ms

$\{23, 65\}$ maximal matching set

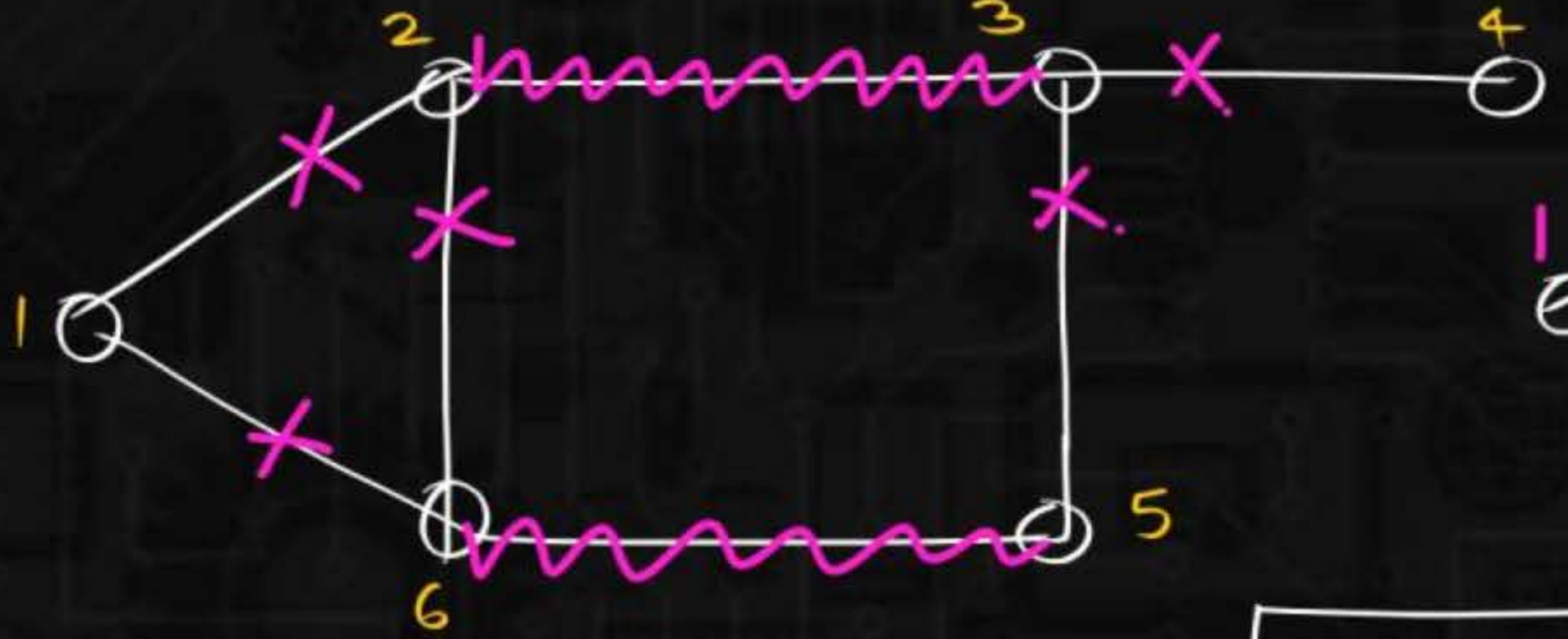


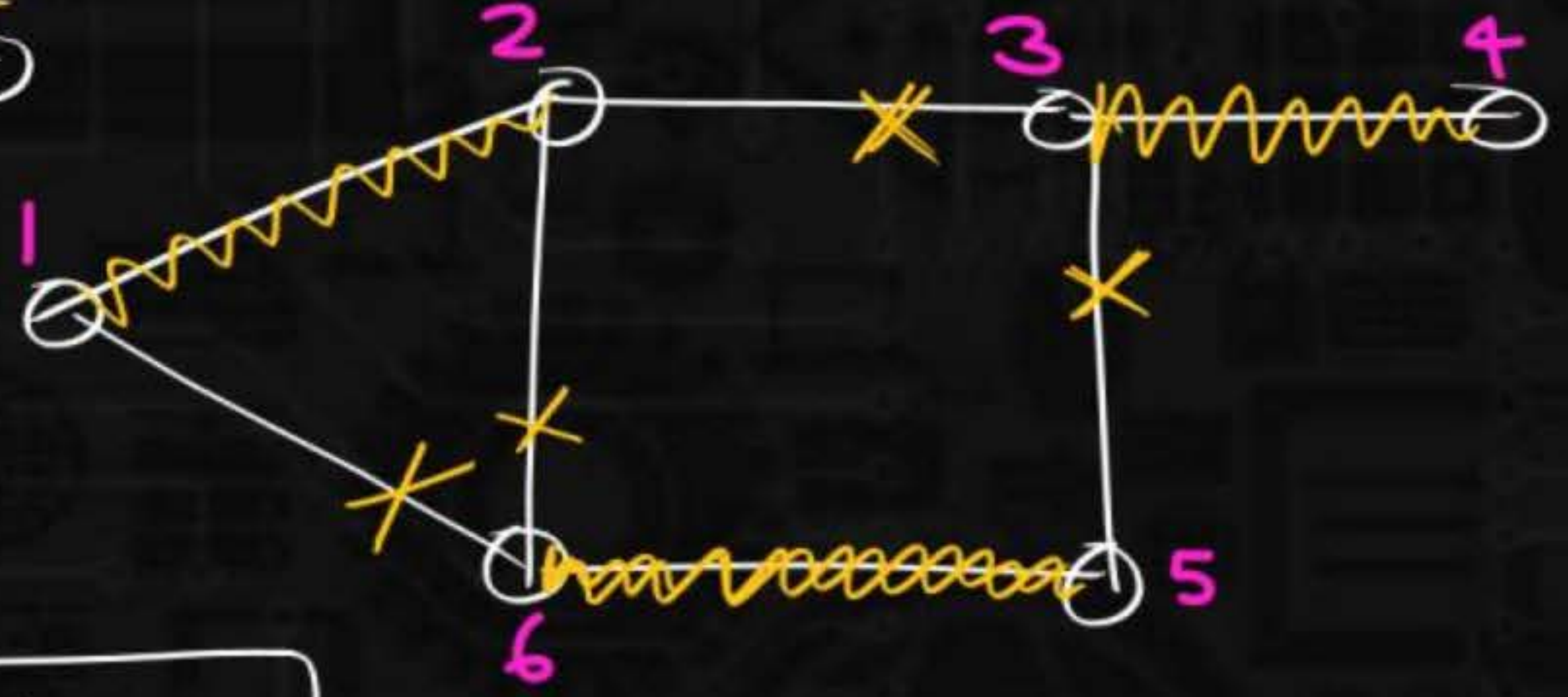
maximal

not related to size but property can not add

maximal matching set

matching set
such that we can
not add new edge
into this.





$\boxed{m(G) = 3}$

mms

$\{23, 65\}$

$\{34\}$ - ms

$\{34, 65\}$ - ms

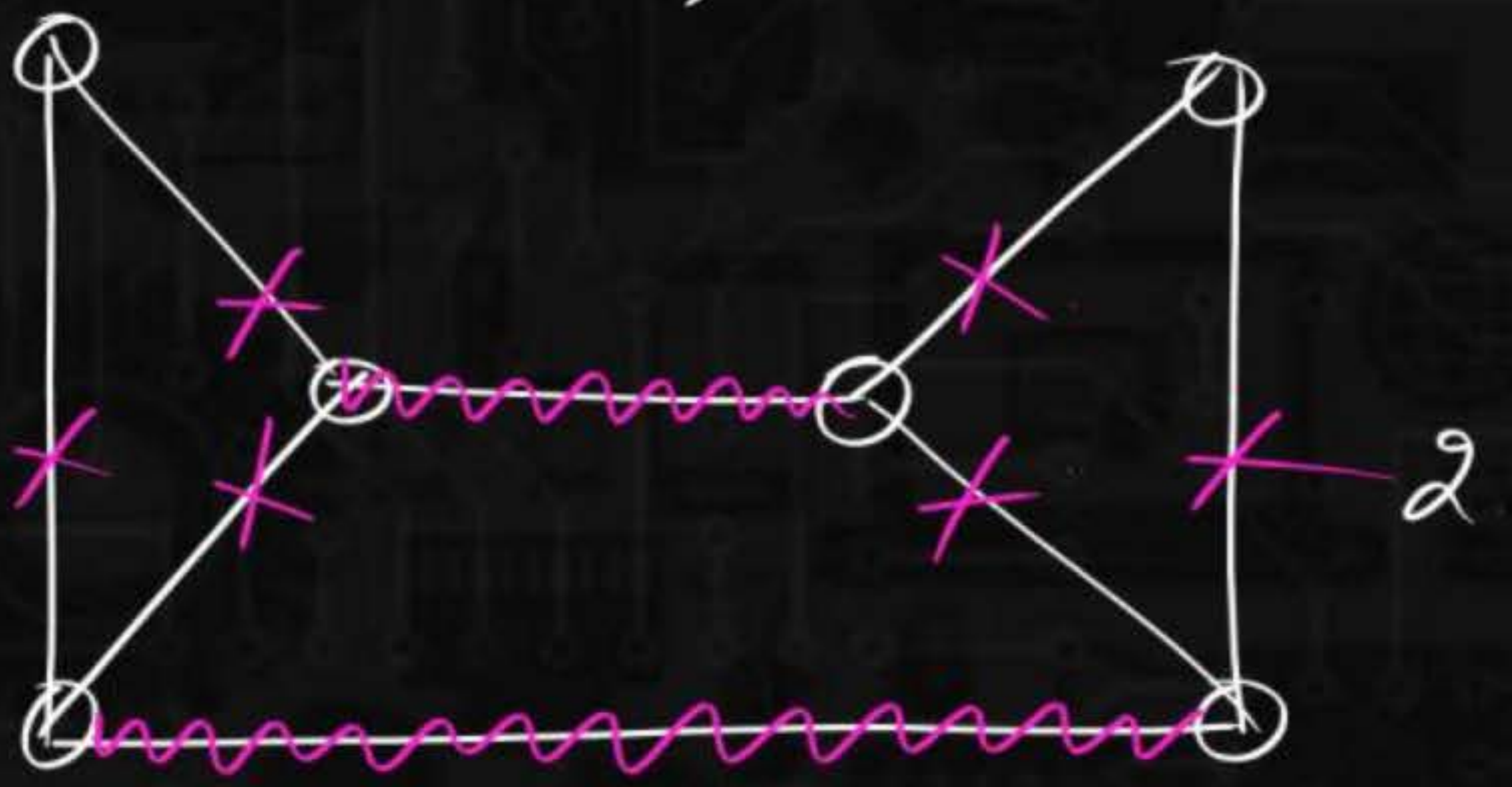
$\{34, 65, 12\}$ mms

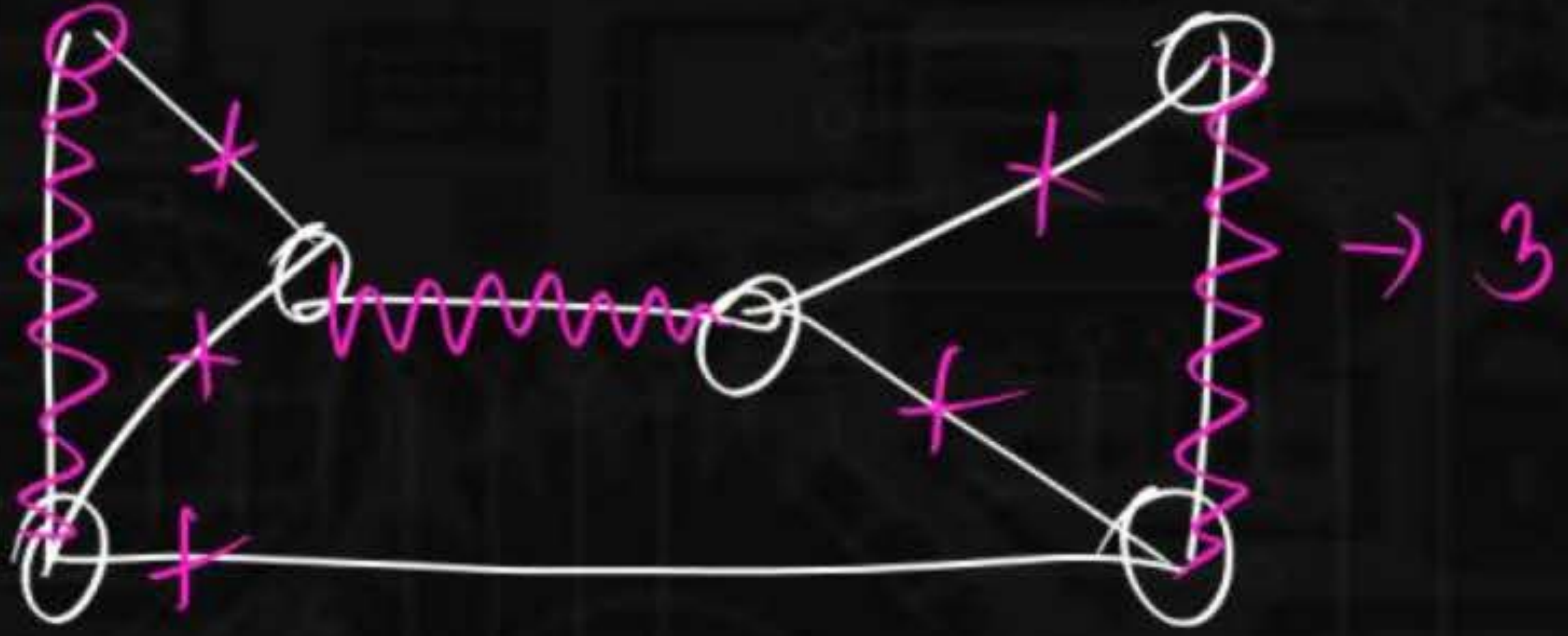
In Graph we can get
Different mms of
diff. sizes.
→ largest one.

<u>matching no.</u> $M(G)$

largest
maximal
matching
set.

$m(G_1) = 3$





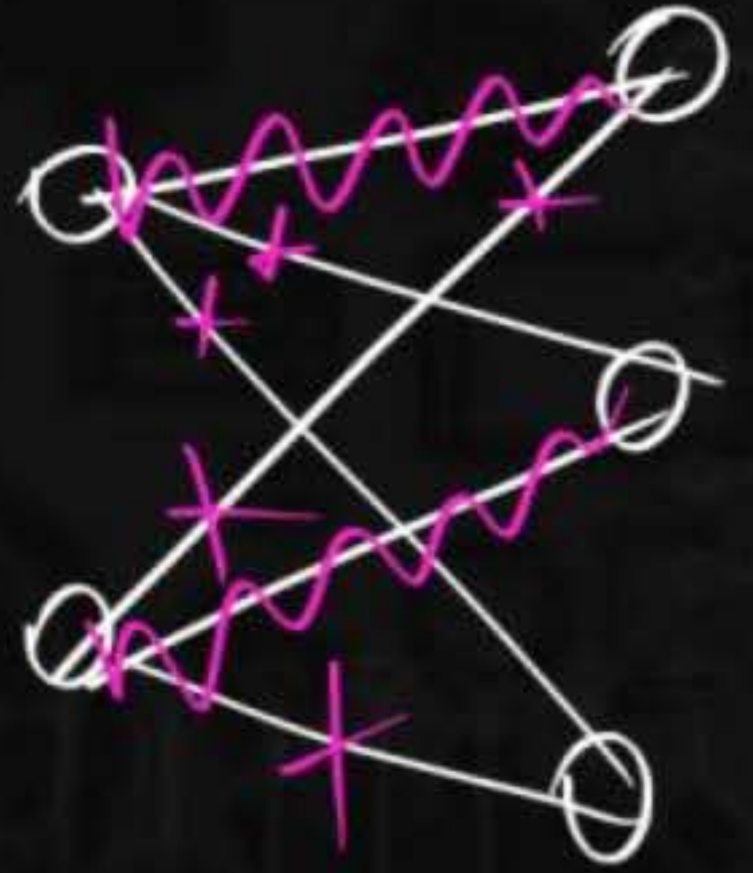
G_2

$m(K_{3,3}) = 3$

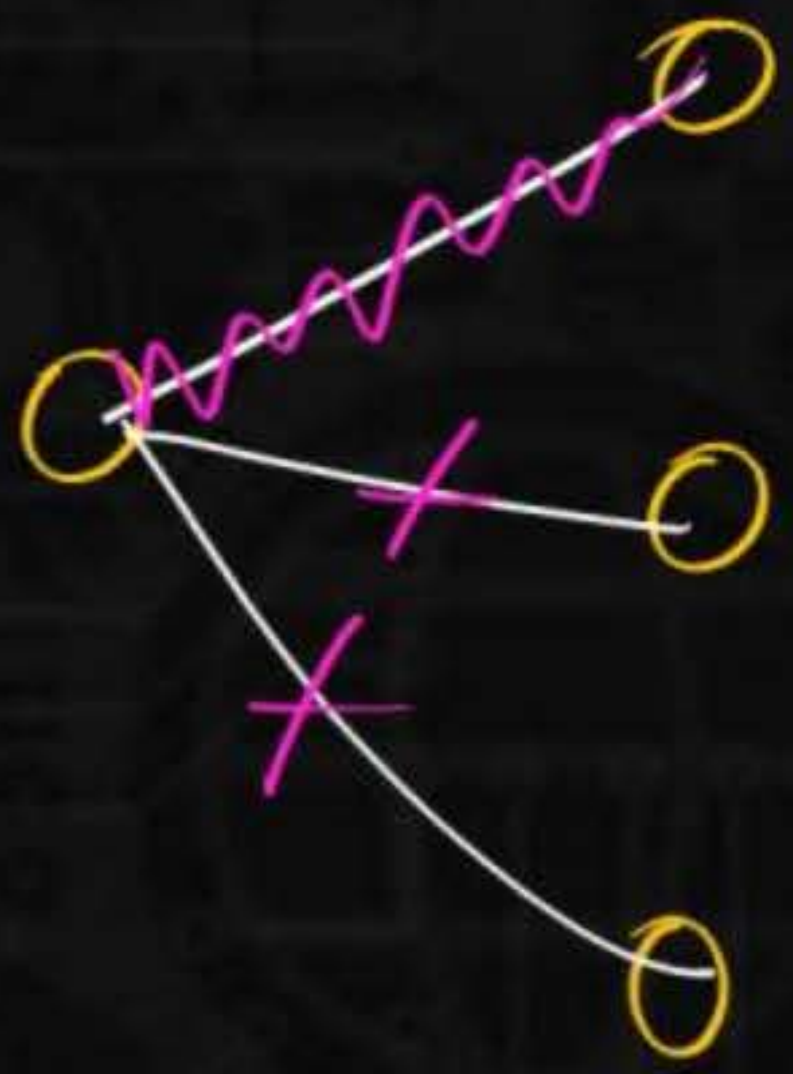
$K_{m,n}$

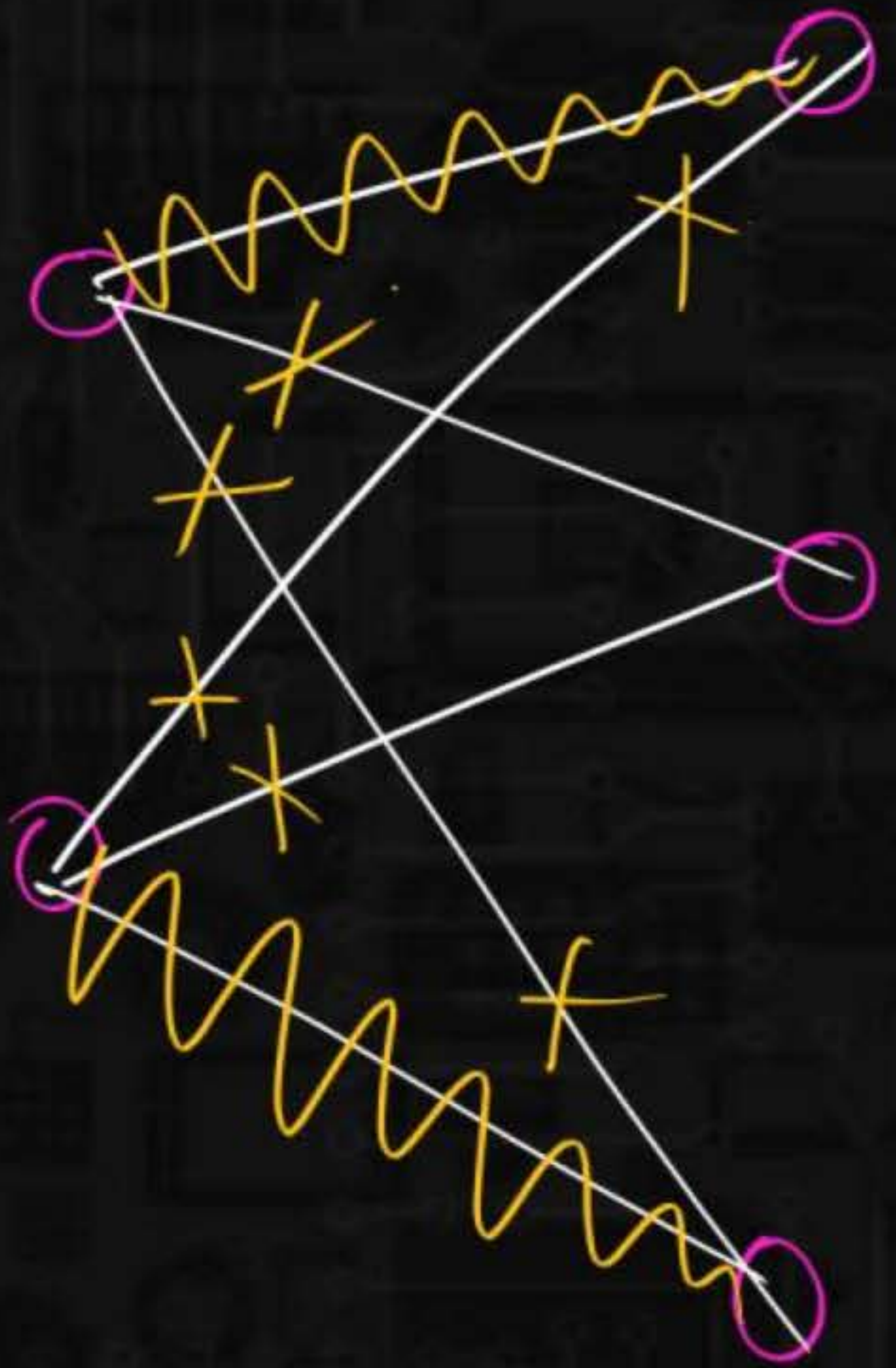
$m(K_{m,n}) =$

eg $m(K_{2,3}) = 2$ $\quad K_{3,3}$



$m(K_{1,3}) = 1$





$m(K_{2,3}) = 2$

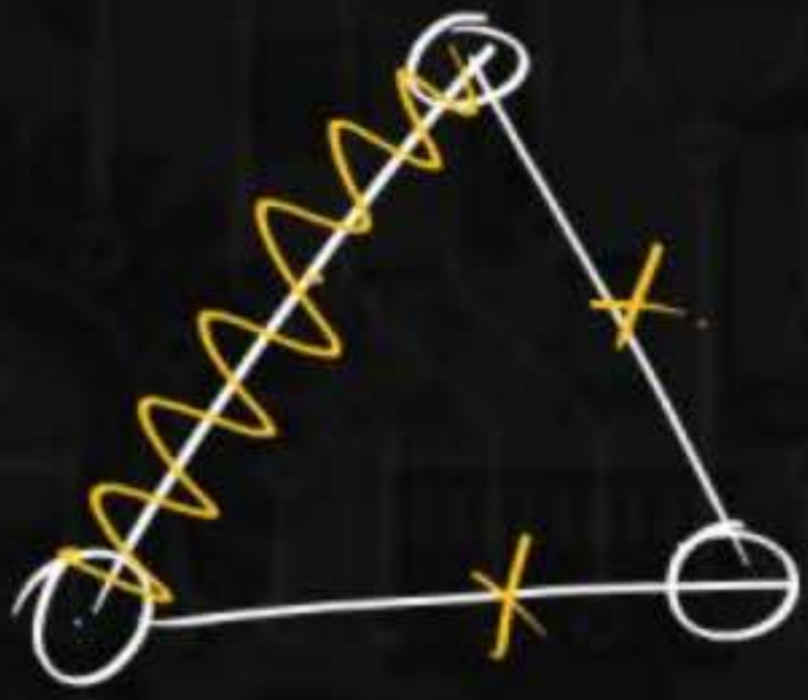
$m(K_{3,3}) = 3$

$$\boxed{m(K_{m,n}) = \min(m,n)}$$

$m(K_{1,4}) = \min(1,4) = 1.$

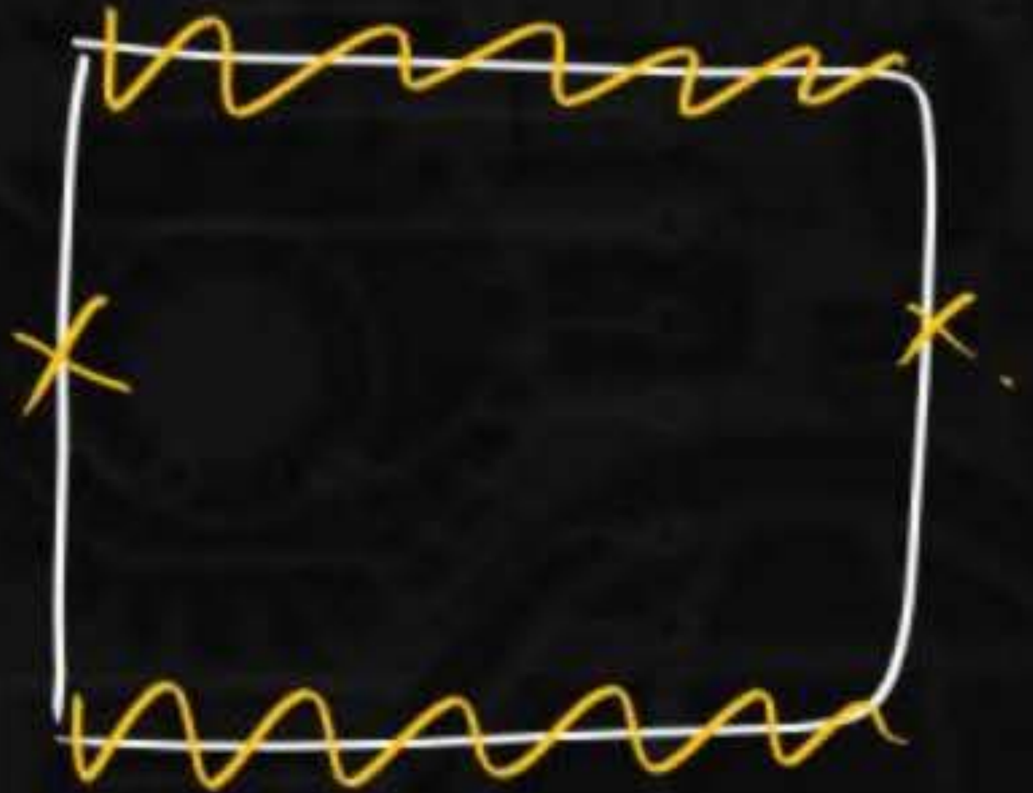
$m(2,3) = \min(2,3) = 2.$

Cycle Graph (C_n) ($n \geq 3$)



$$m(C_3) = 1$$

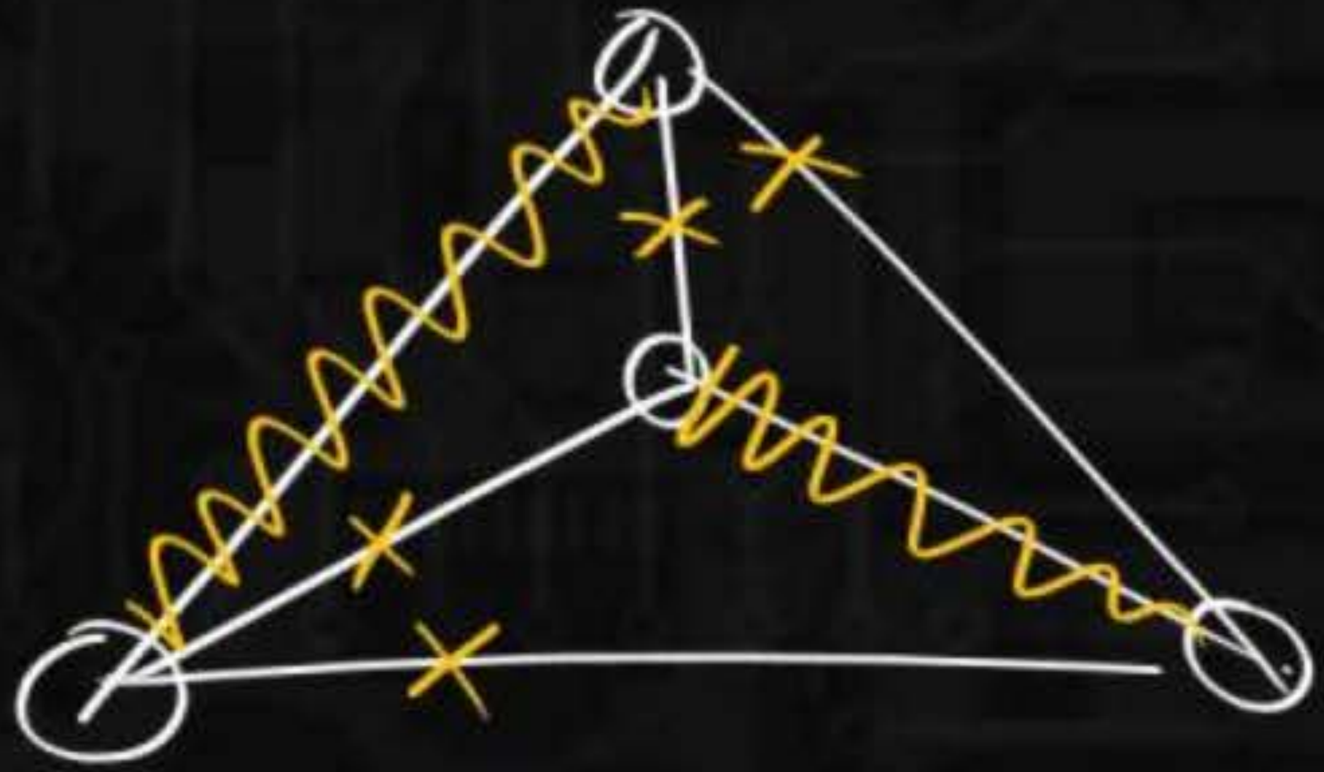
$$\frac{3}{2} = \lfloor 1.5 \rfloor$$



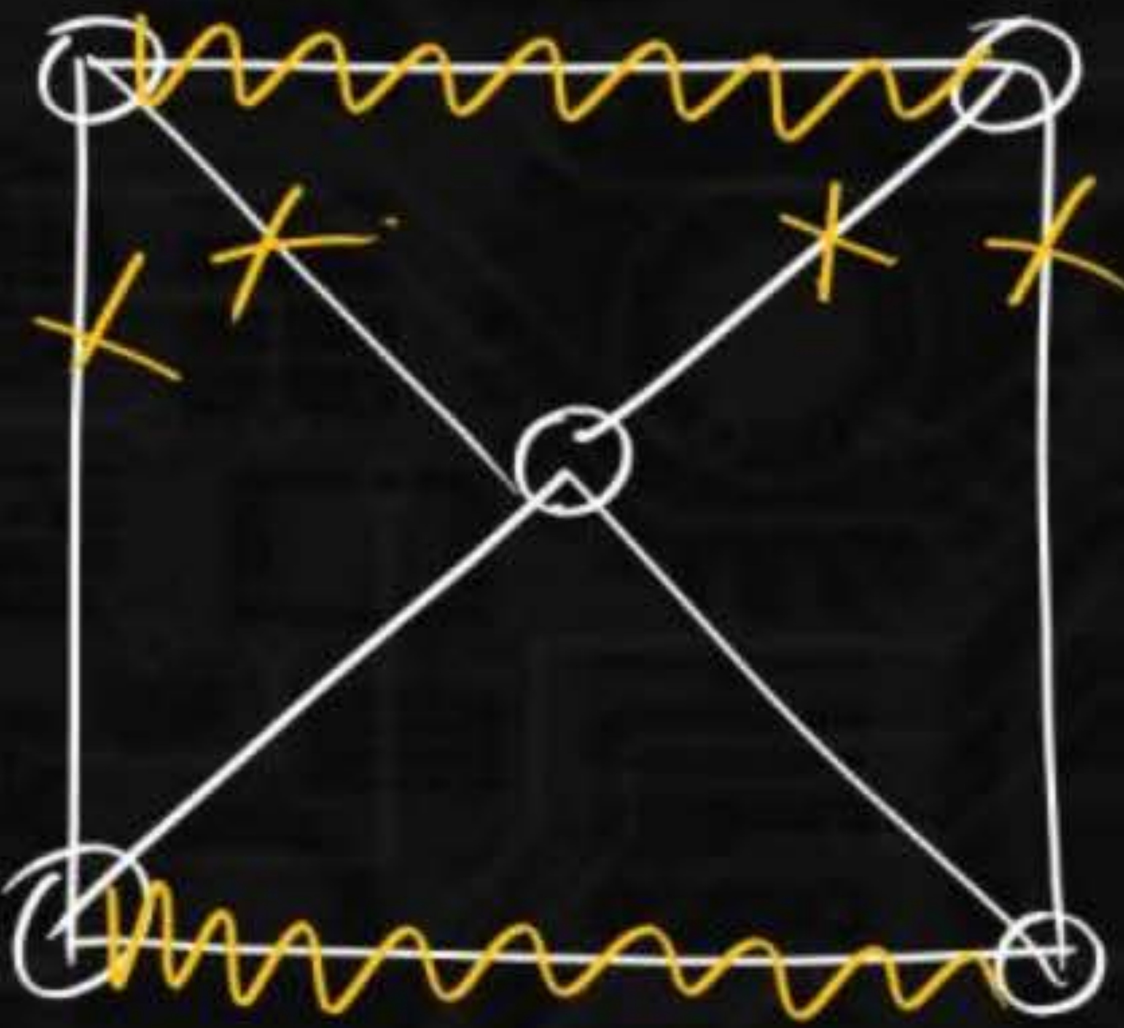
$$m(C_4) = \lfloor 2 \rfloor = 2$$

$$m(C_n) = \left\lfloor \frac{n}{2} \right\rfloor$$

Wheel Graph (W_n)($n \geq 4$)



$m(W_4) = 2$



W_5.

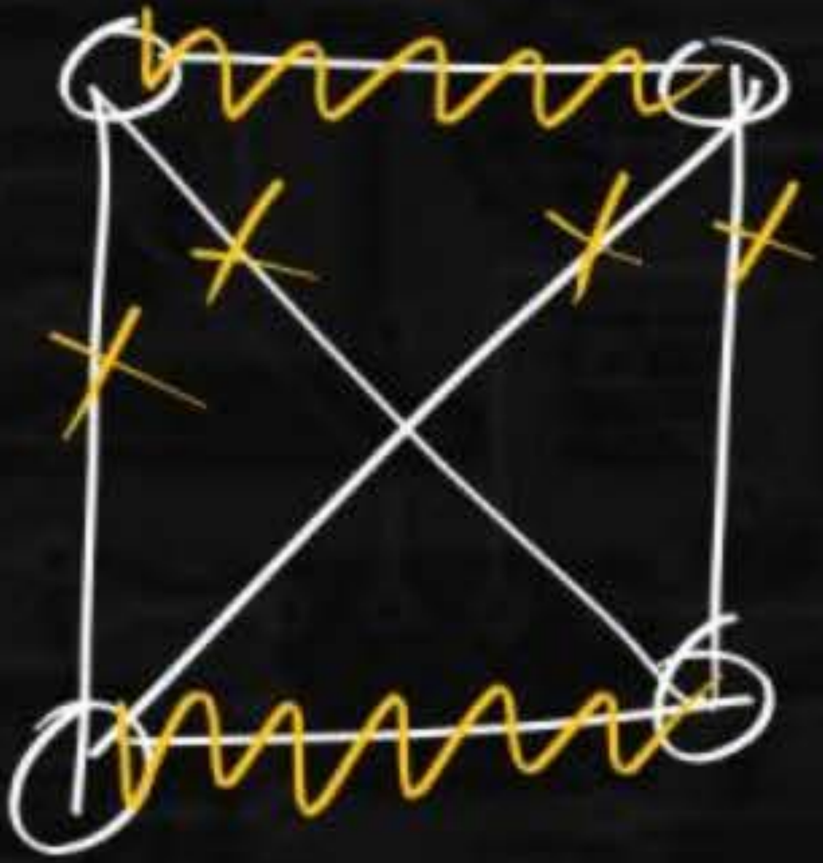
$m(W_5) = 2$

$m(W_n) = \lfloor n/2 \rfloor$

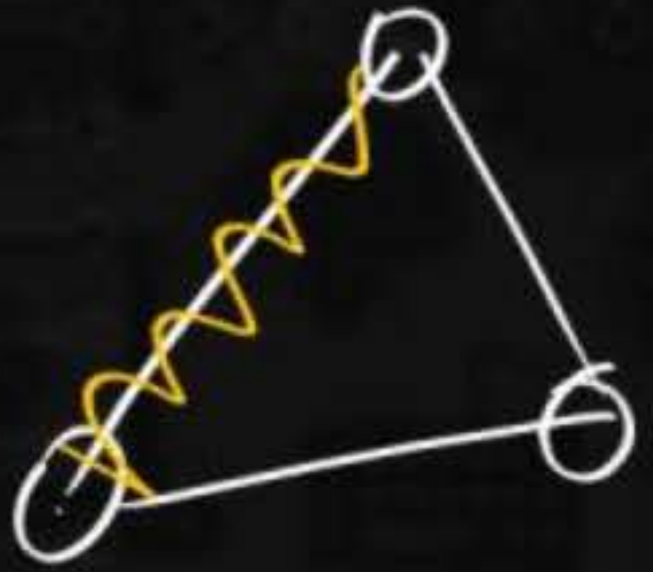
Complete Graph (K_n) ($n \geq 1$)

$m(K_n) = \lfloor n/2 \rfloor$

$m(K_2) = 1$



$m(K_4) = 2.$

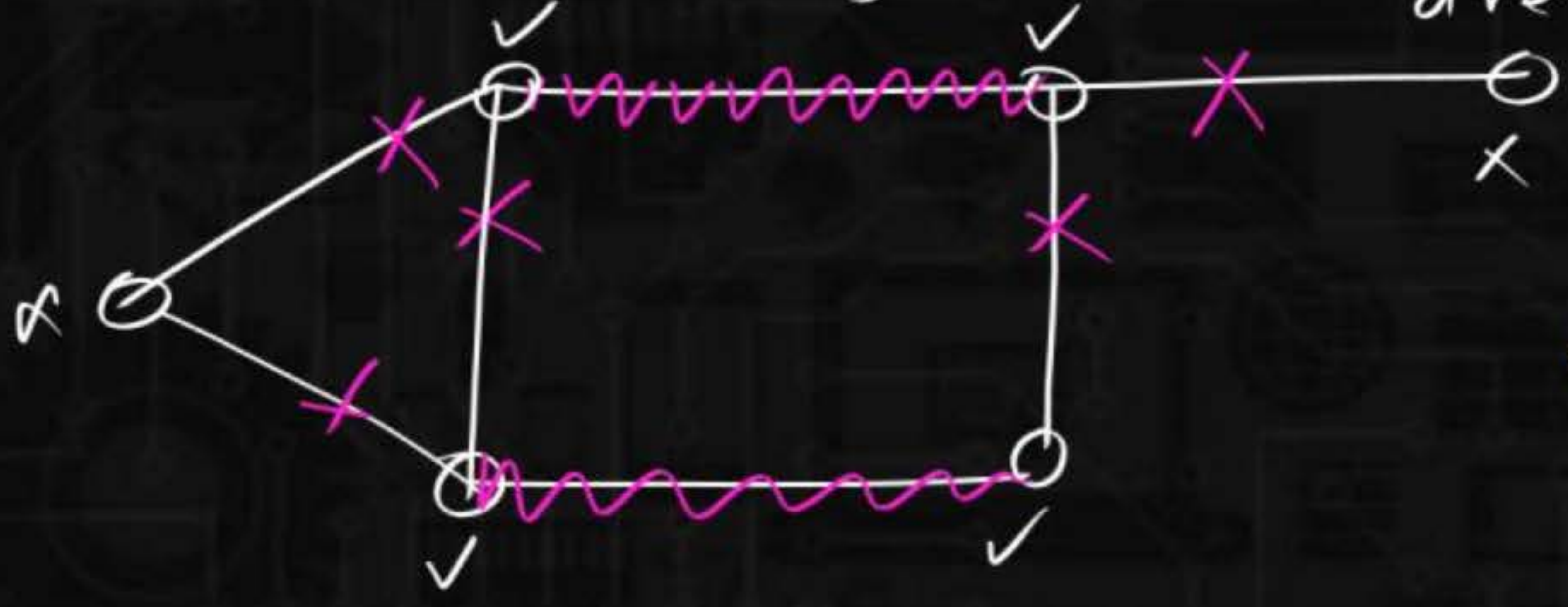


$m(K_3) = 1$

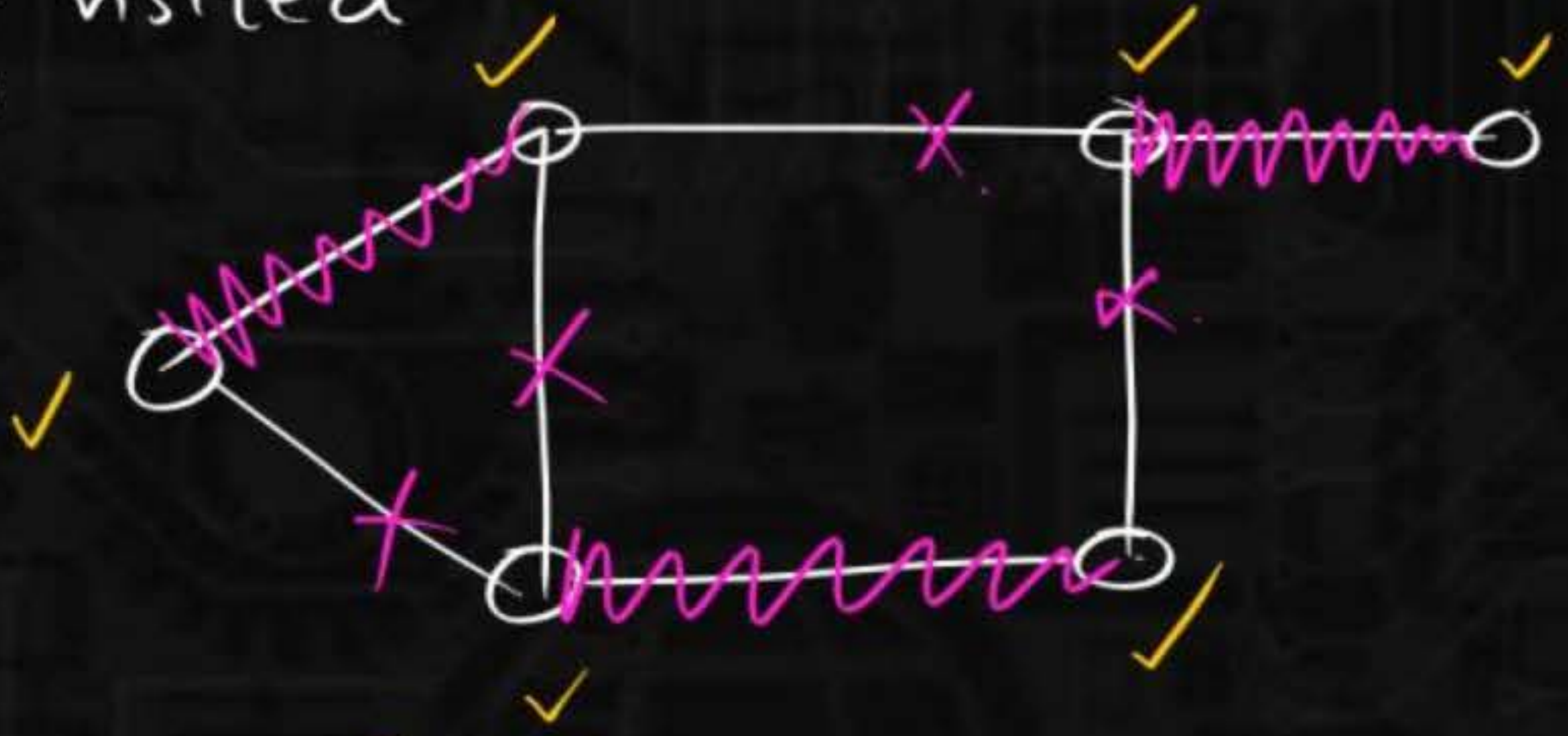
$$m(K_n) = m(C_n) = m(W_n) = \lfloor n/2 \rfloor$$

$$m(K_{m,n}) = \min(m, n)$$

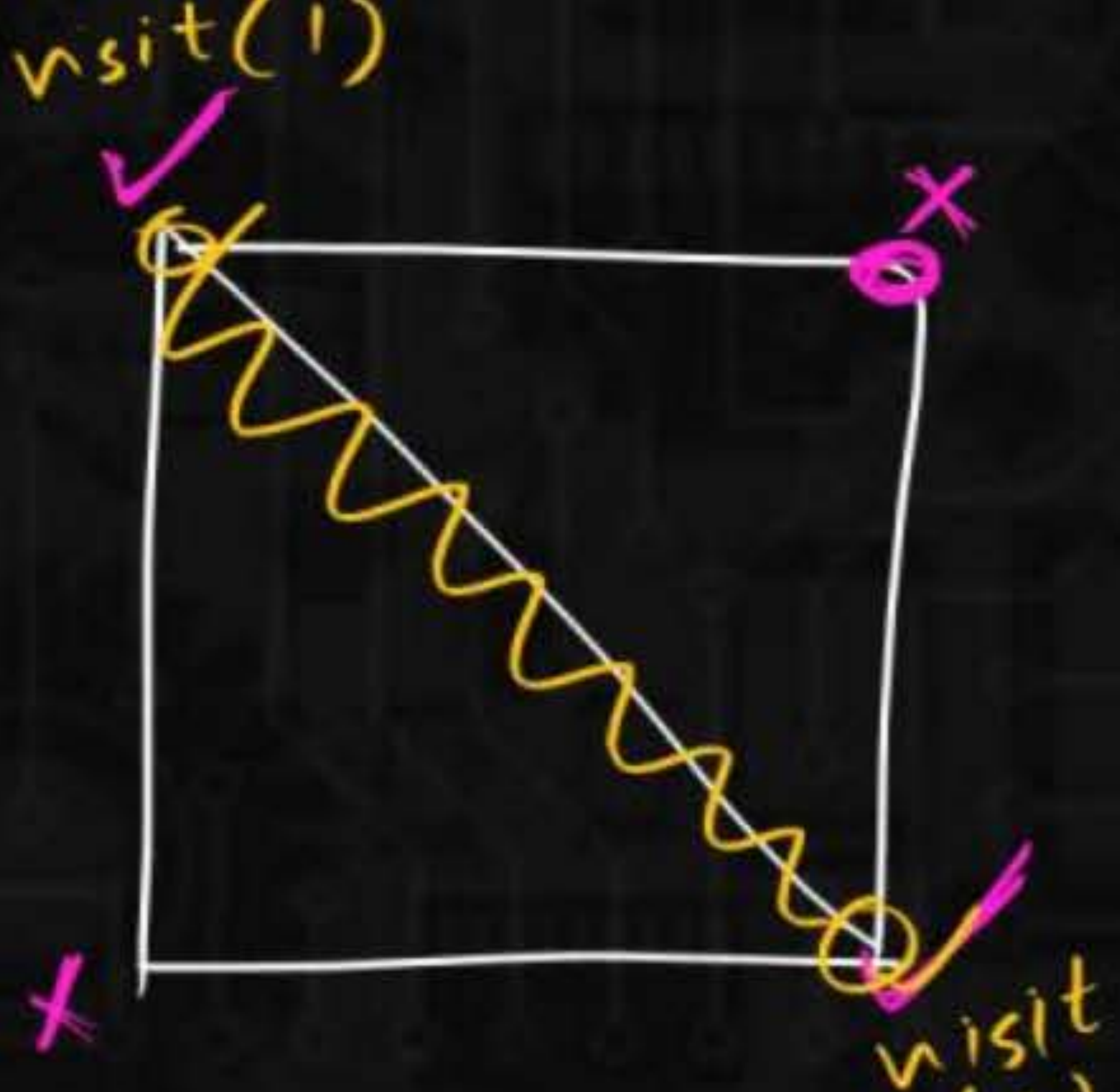
collection of edges → all vertices are visited



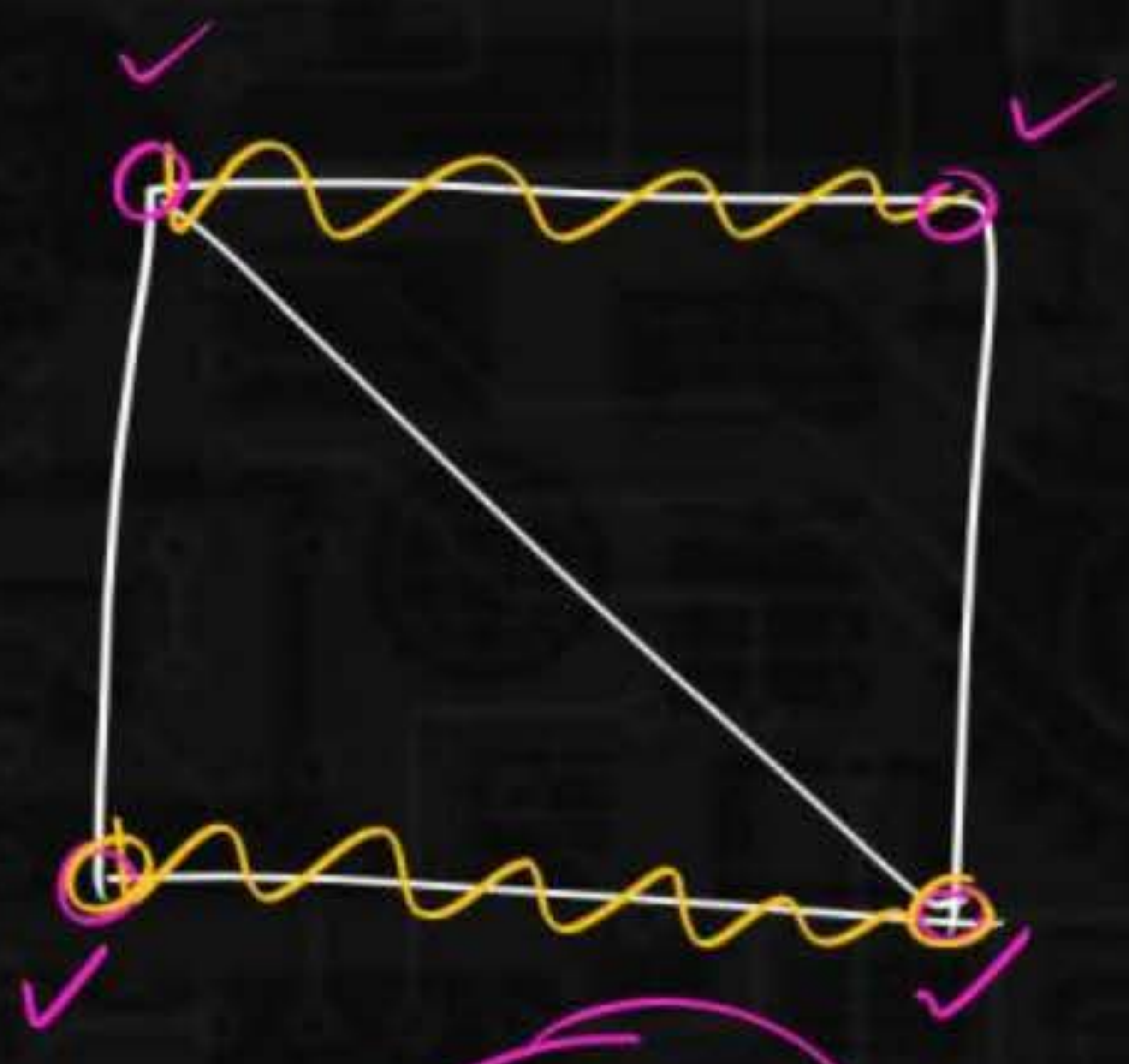
maximal matching set



maximal matching set



mms



mms

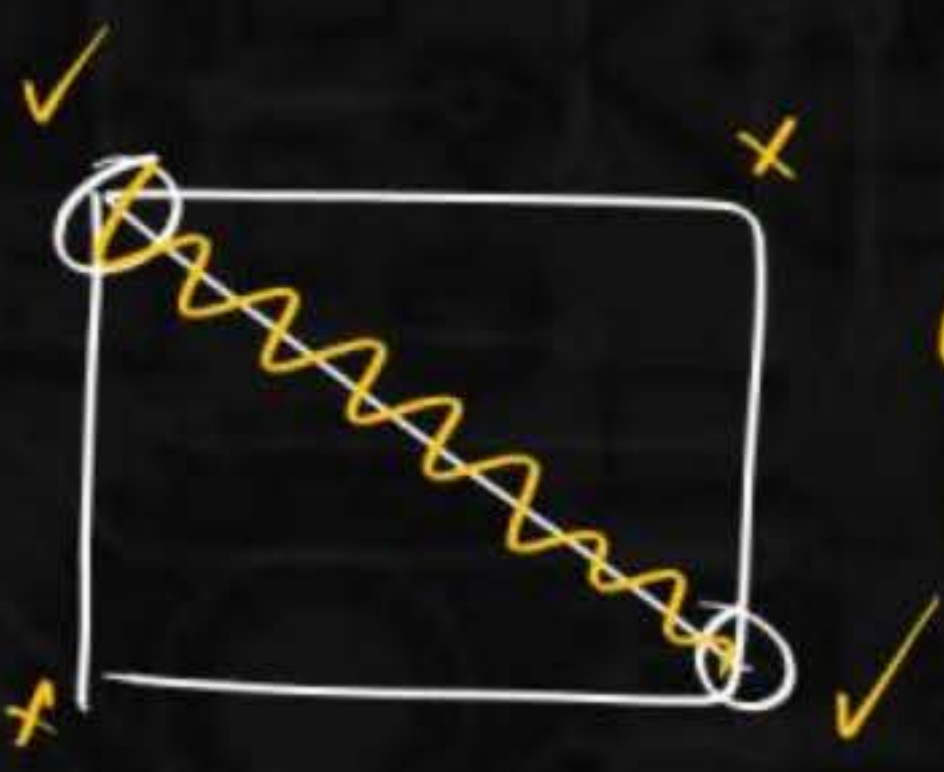
$\boxed{\text{mms}}$ Pack.

↓

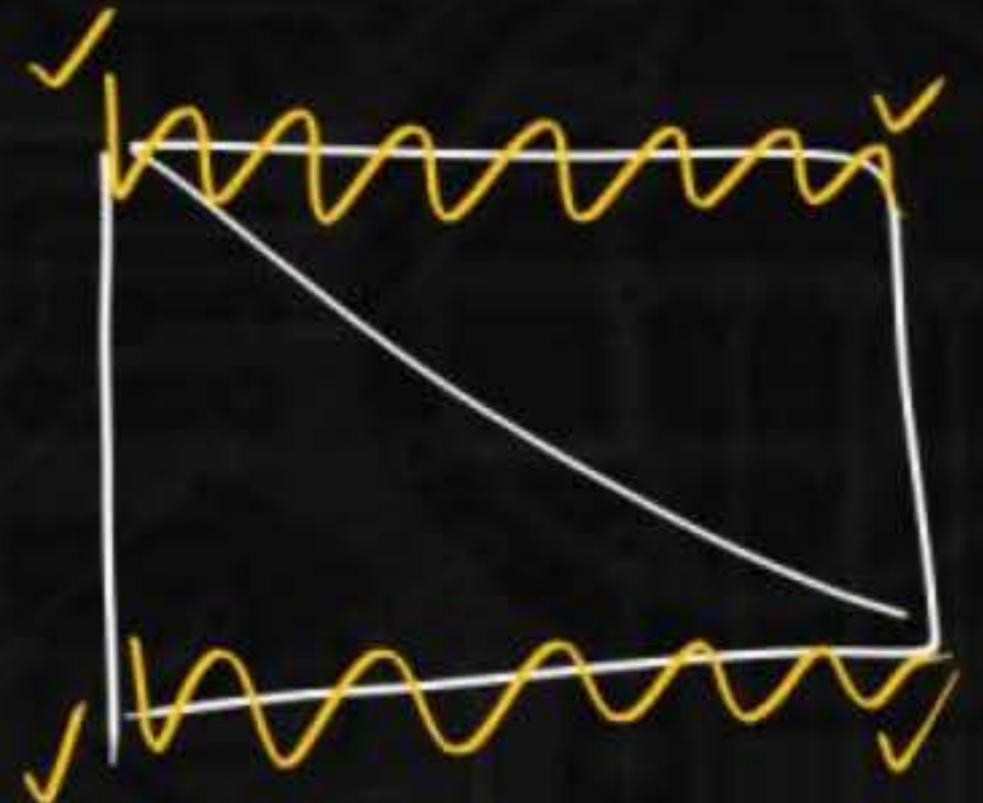
all vertices must be visited by collection of edges.

Perfect matching

maximal matching set, such that collection of edges such that it should visit all vertices

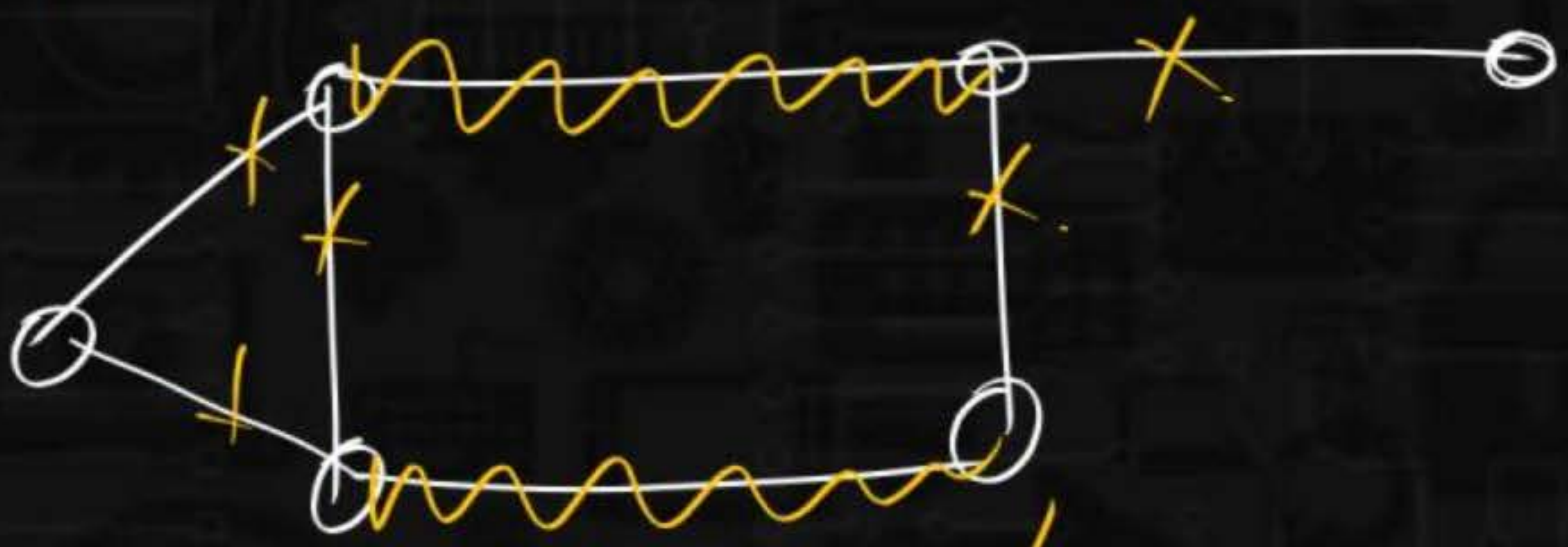


mms ✓
p.m ✗



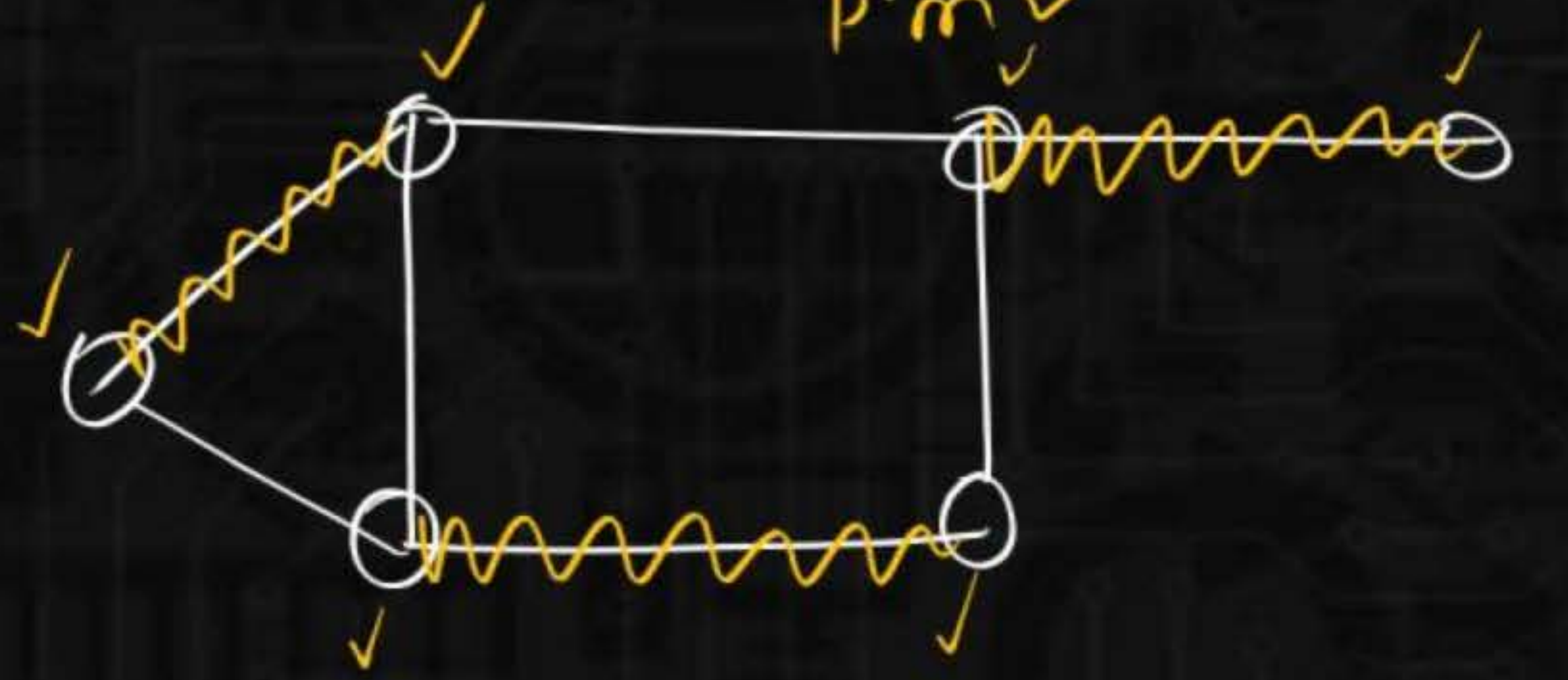
mms ✓
p.m ✓

Every P.M is maximal matching set but viceversa is not true.



mms ✓

P.M ✗



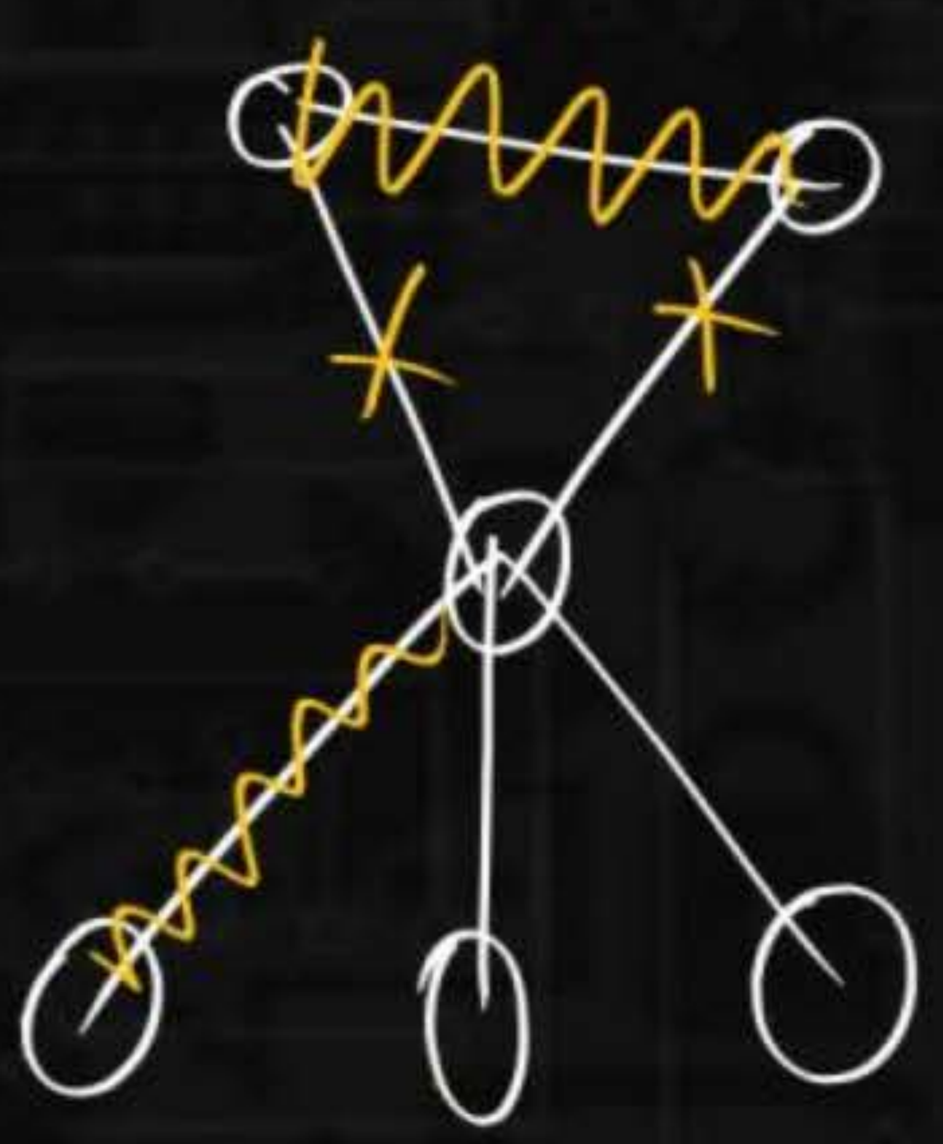
mms ✓

P.m ✓

if P.M exist then no. of vertices will be even.

if G is having even no. of vertices then P.M exist.

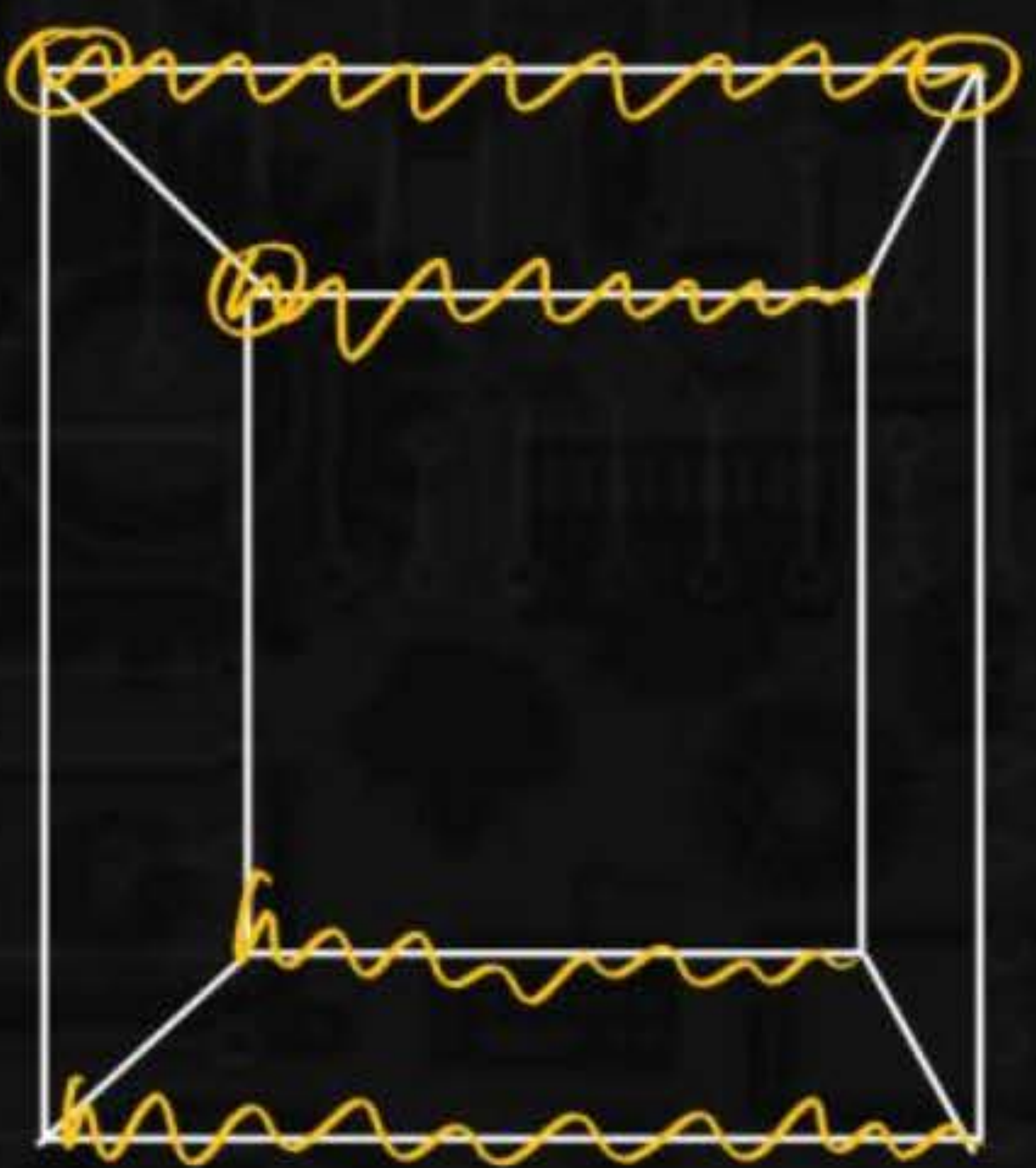
(false)



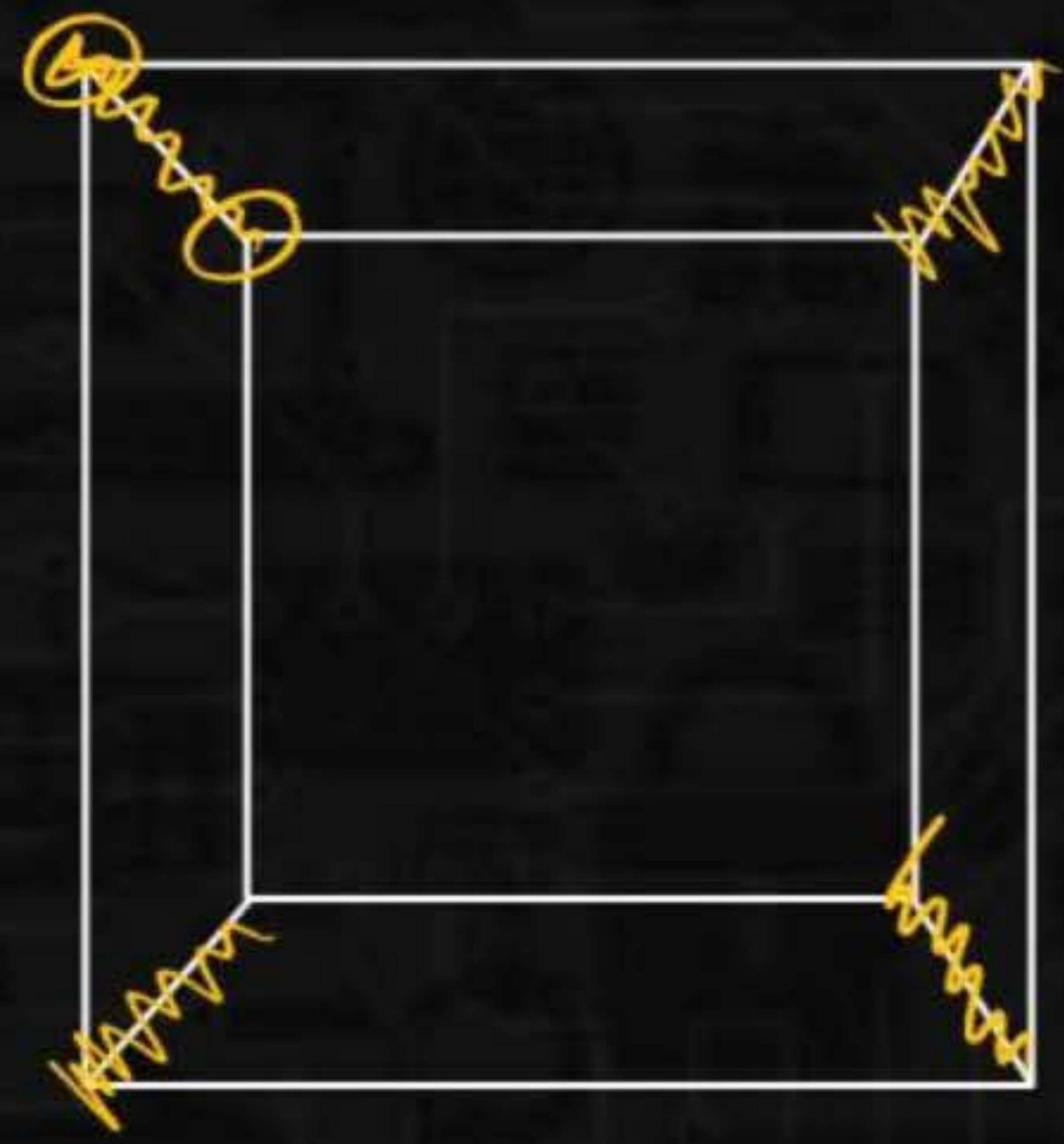
$n = 6$

In Graph we can have different P.M

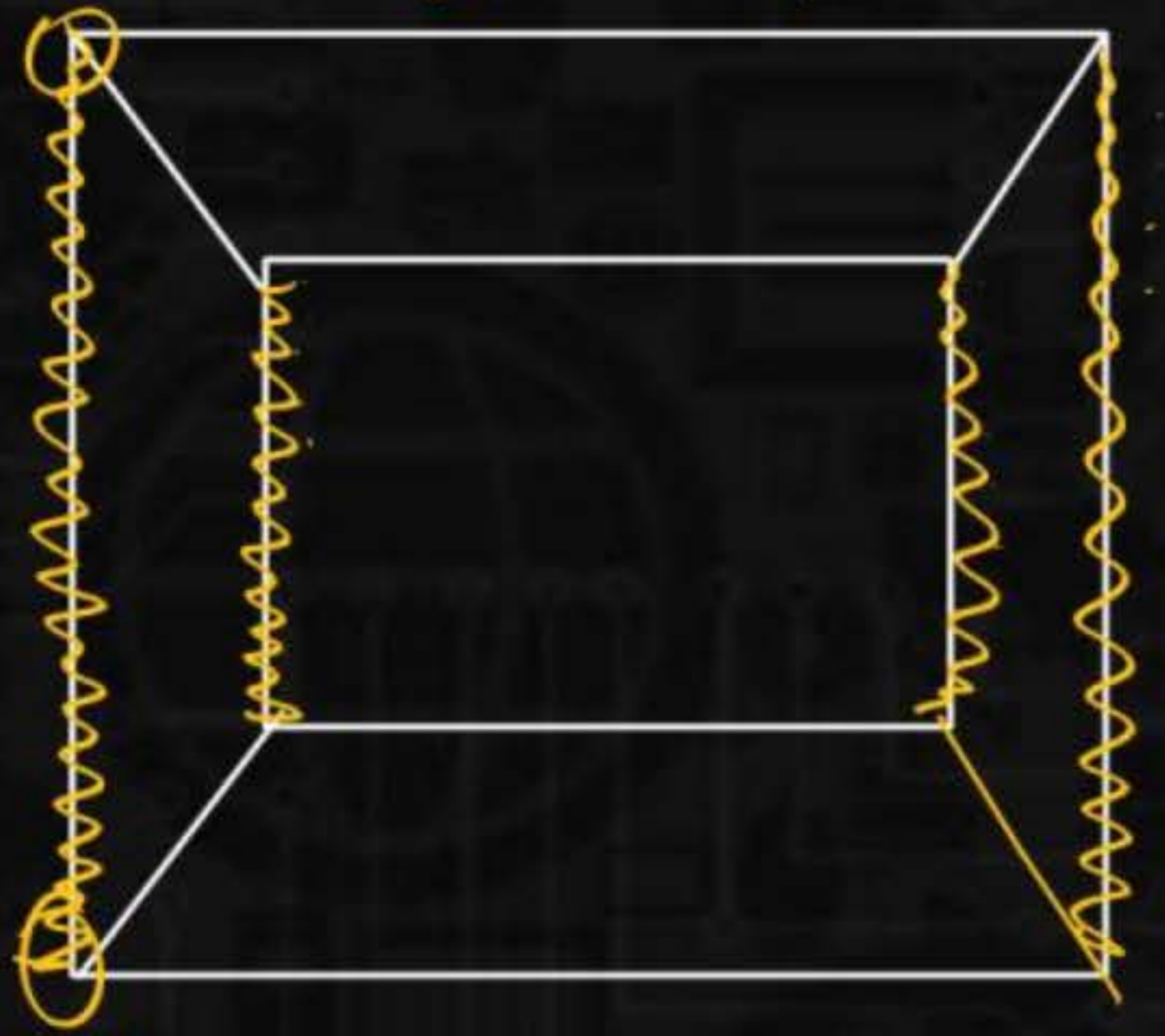
1 Type-PM



2 Type-PM

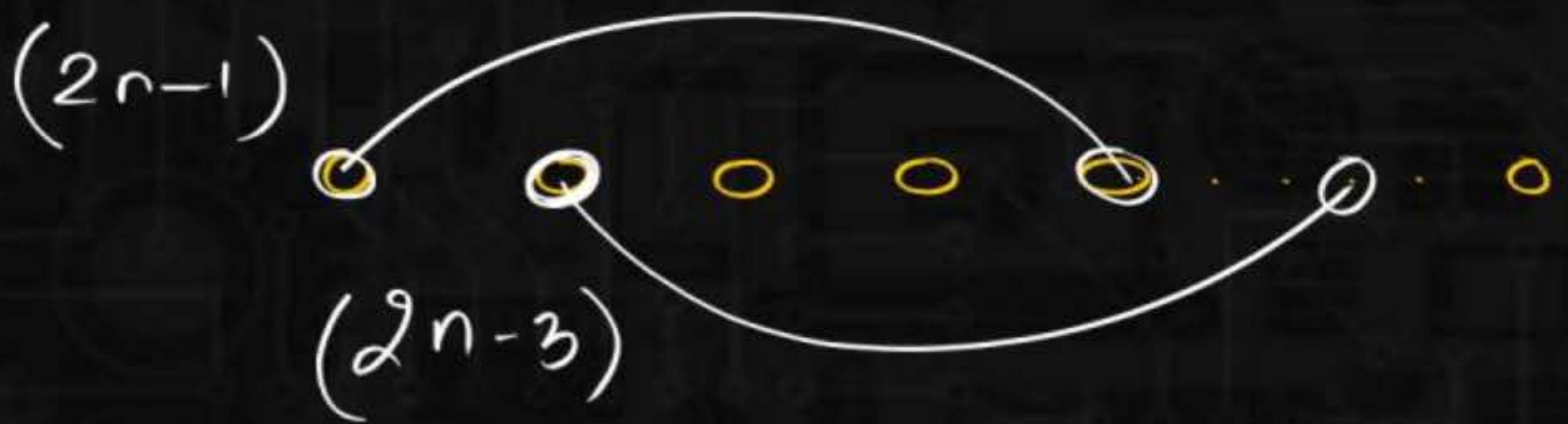


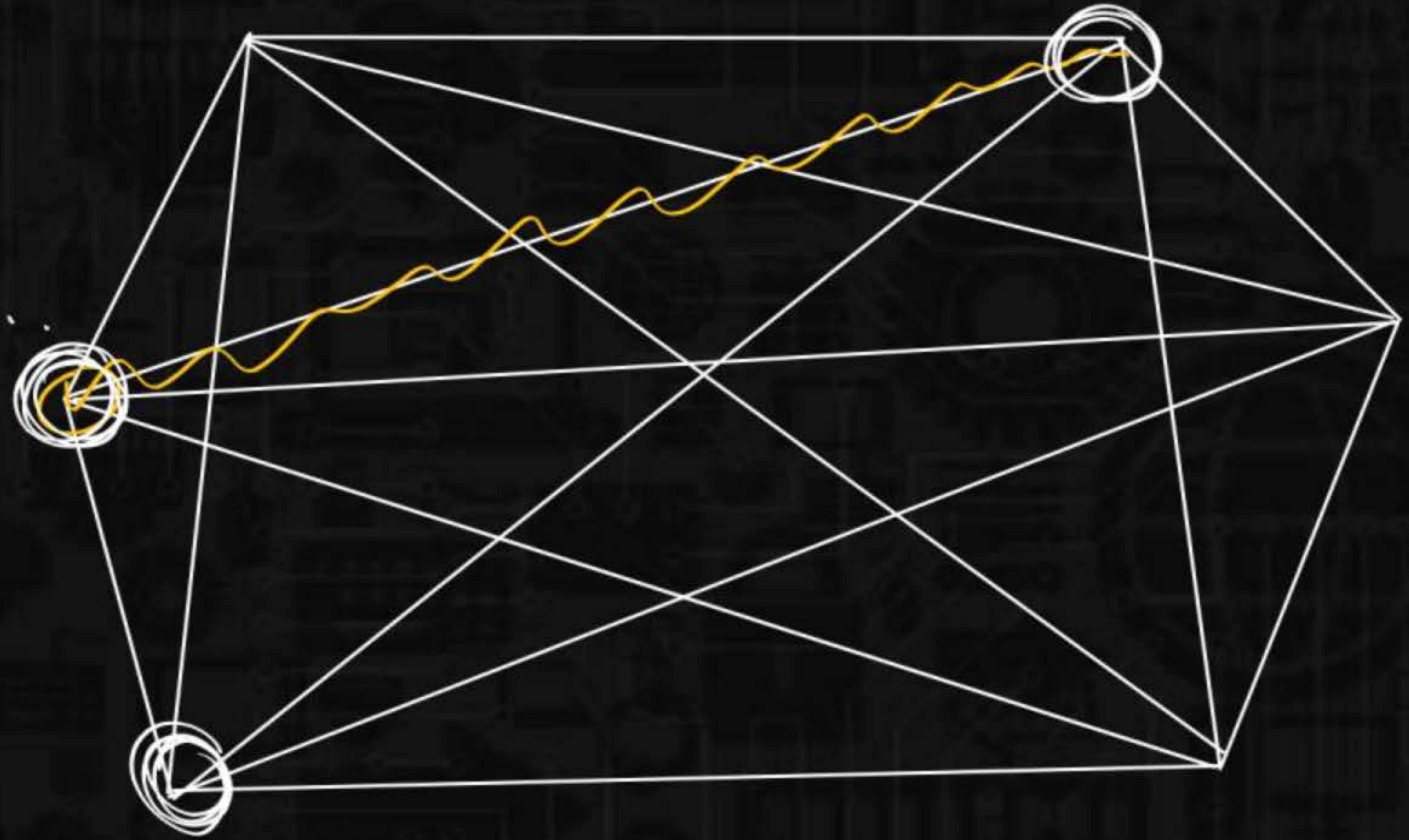
3 Type-PM



Total no. of P.M in Complete Graph of 2n vertices.

Total vertices = 2n.





$$(2n-1)\cdot(2n-3)\cdot(2n-5)$$

$$\frac{2n}{2n}\times(2n-1)\times\frac{(2n-2)}{(2n-2)}\times(2n-3)\times\frac{(2n-4)}{(2n-4)}\times(2n-5)\ldots\ldots$$

$$=\frac{(2n)!}{2n\cdot(2n-2)(2n-4)\ldots}=\frac{(2n)!}{2^n\times n\times(n-1)(n-2)\ldots}=\frac{(2n)!}{2^n\times n!}$$

take 2 common


THANK YOU GW
SOLDIERS !