CS & IT ENGINEERING

Discrete Mathematics
Graph Theory
Lecture No. 10

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01 Matching set

02 Maximal matching set

03 Matching no.

04 Covering set

05 Covering number

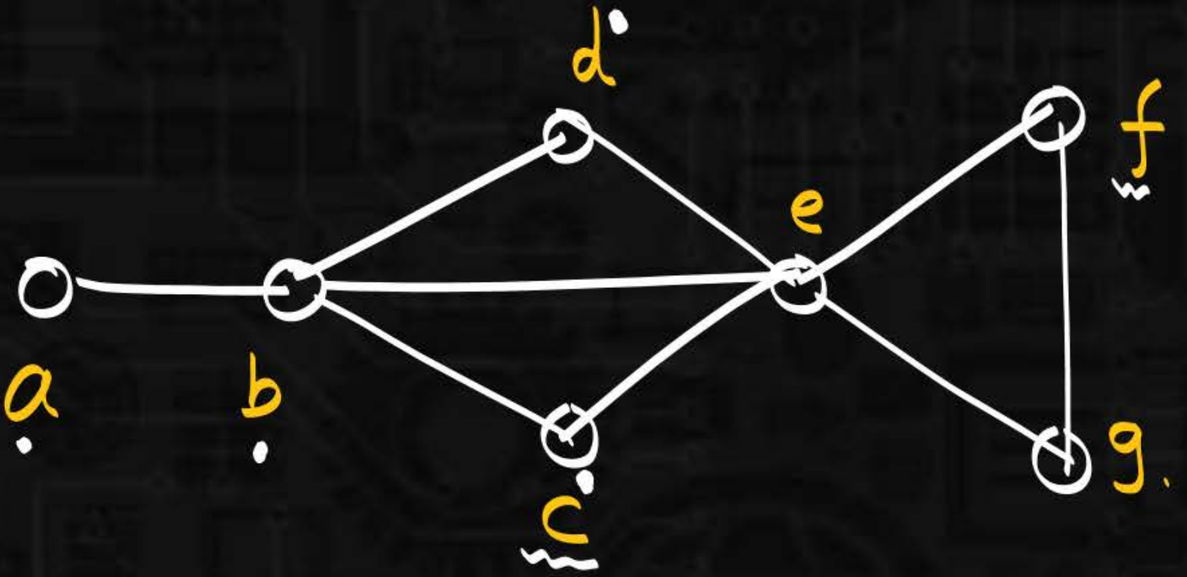
Independent set: set of non adjacent vertices.

maximal Independent set : Independent set such that we can not add new vertex into this.

Independence no($\beta(G)$): no. of vertices present in largest maximal Independent set.

Dominating set :

$G = (V, E)$



Dominating set (D) $D \subseteq V$

if we take any vertex of V, either that vertex belongs to D or its adjacent belongs to D.

$V = \{a, b, c, d, e, f, g\}$

$D = \{a, b, e\}$ → Dominating set

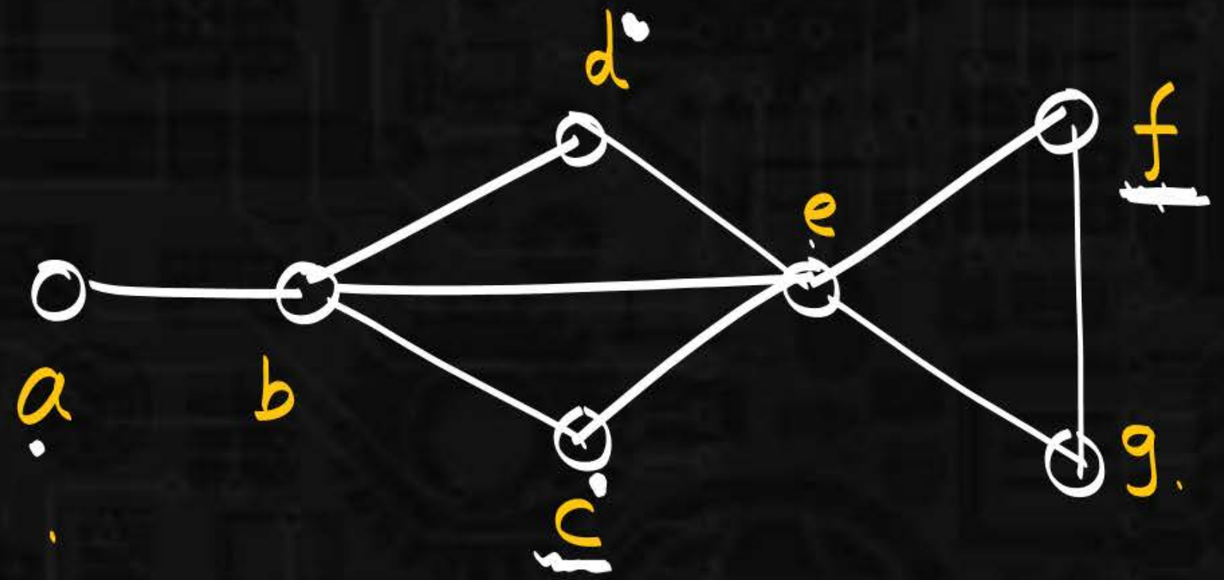
{a b c d e f g} → DS

{a c d e f g} → DS

{a d e f g} → DS

{a e f g} → DS

{a e g} → DS

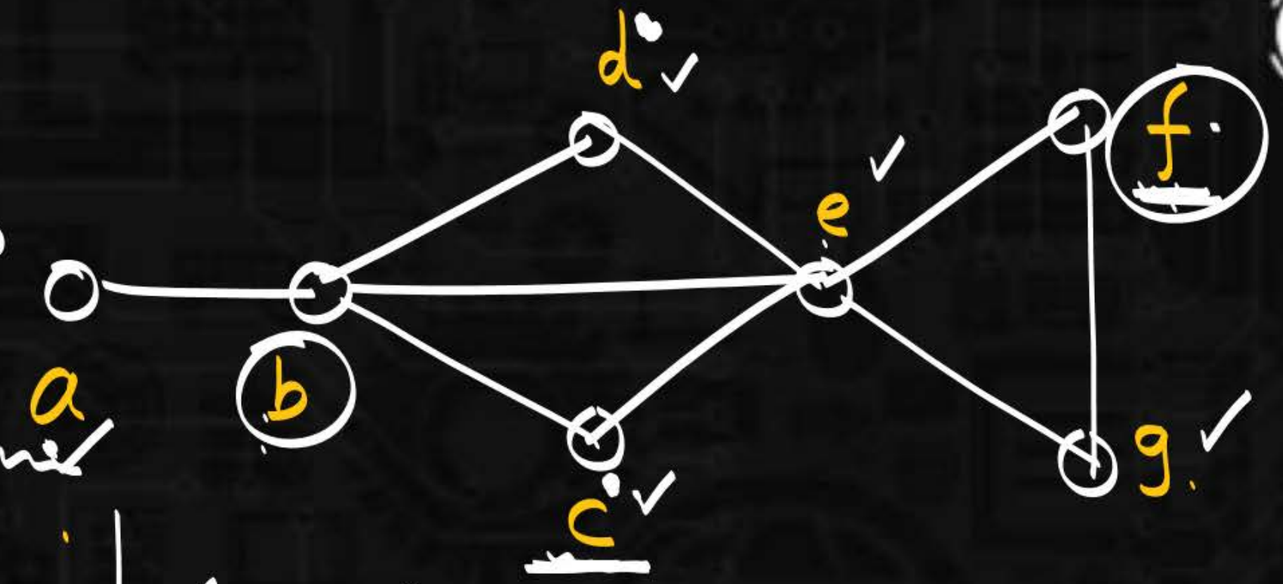


{a e} → DS

minimal dominating set

minimal dominating set:

Dominating set, such that we can not remove any new vertex from this.



{ae} → MDS.

{acdf} → MDS

{acdg} → MDS.

{bf} → MDS.

{bg} → MDS.

{be} → MDS.

$\alpha(G) = 2.$

Domination no. ($\alpha(G)$)

no. of vertices present in smallest minimal dominating set.

maximal:

not related size but property such that we can not add new vertex into this.

minimal: not related size. but property such that we can not remove anything.

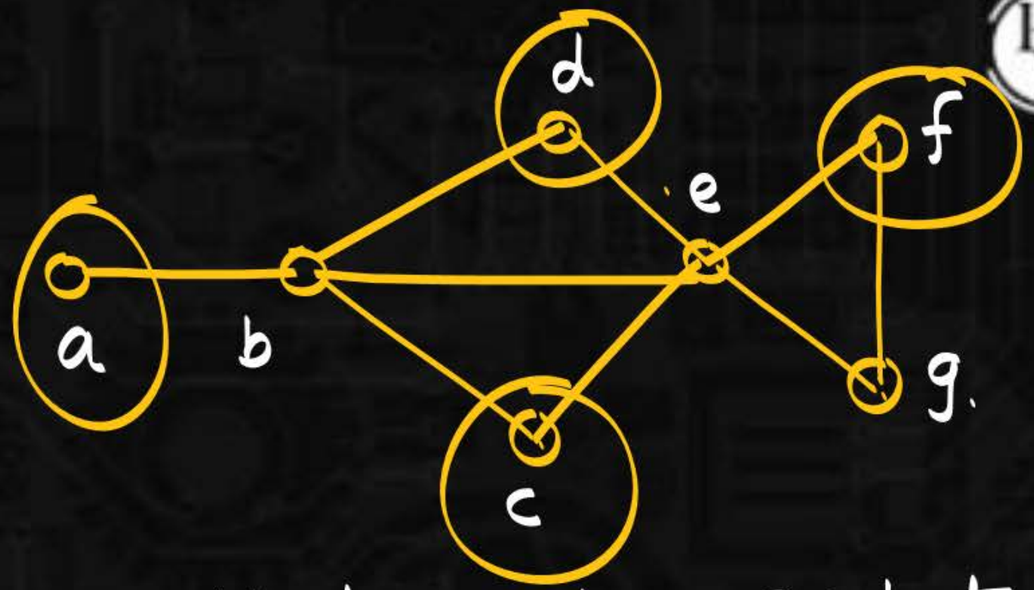
can not add

maximal Independent set

{acdf}
{acdg}
{bf}
{bg}
{ae}

minimal dominating set

{acdf}
{acdg}
{bf}
{bg}
{ae}
{be}



Every MIS will always be MDS but viceversa is not true.

Domination no $\leq$ Independence no

$$\alpha(G) \leq \beta(G).$$

Independent set:

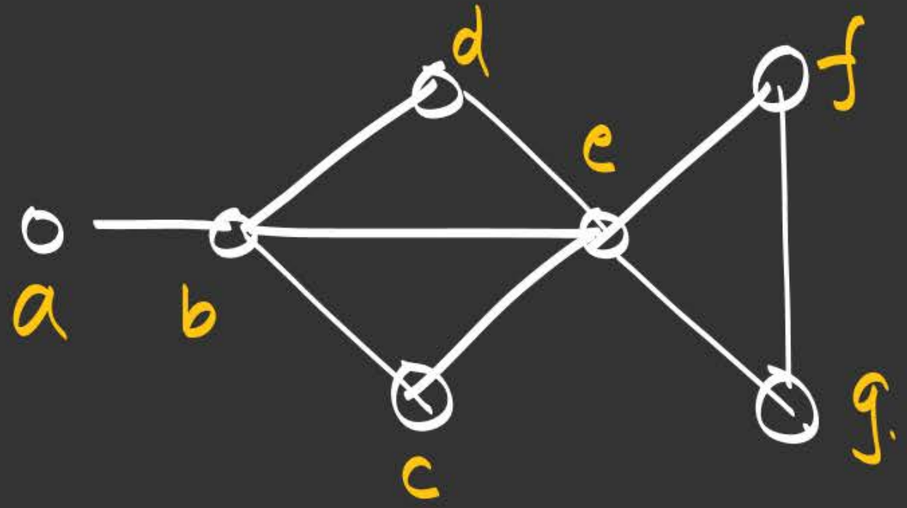
Set of non adjacent vertices.

maximal Independent set

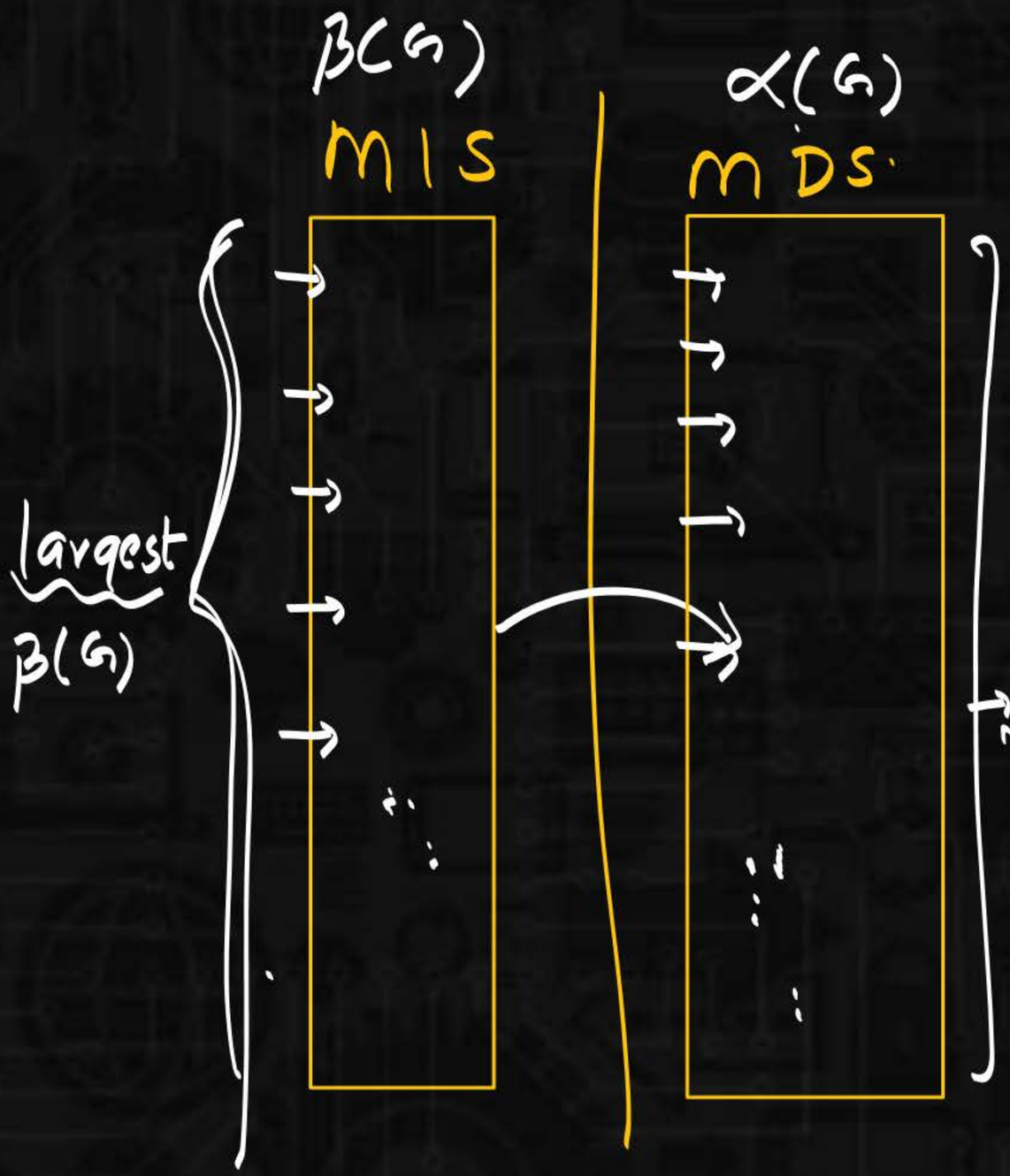
Dominating set.

minimal Dominating set.

↳ can not remove.



{b, e}

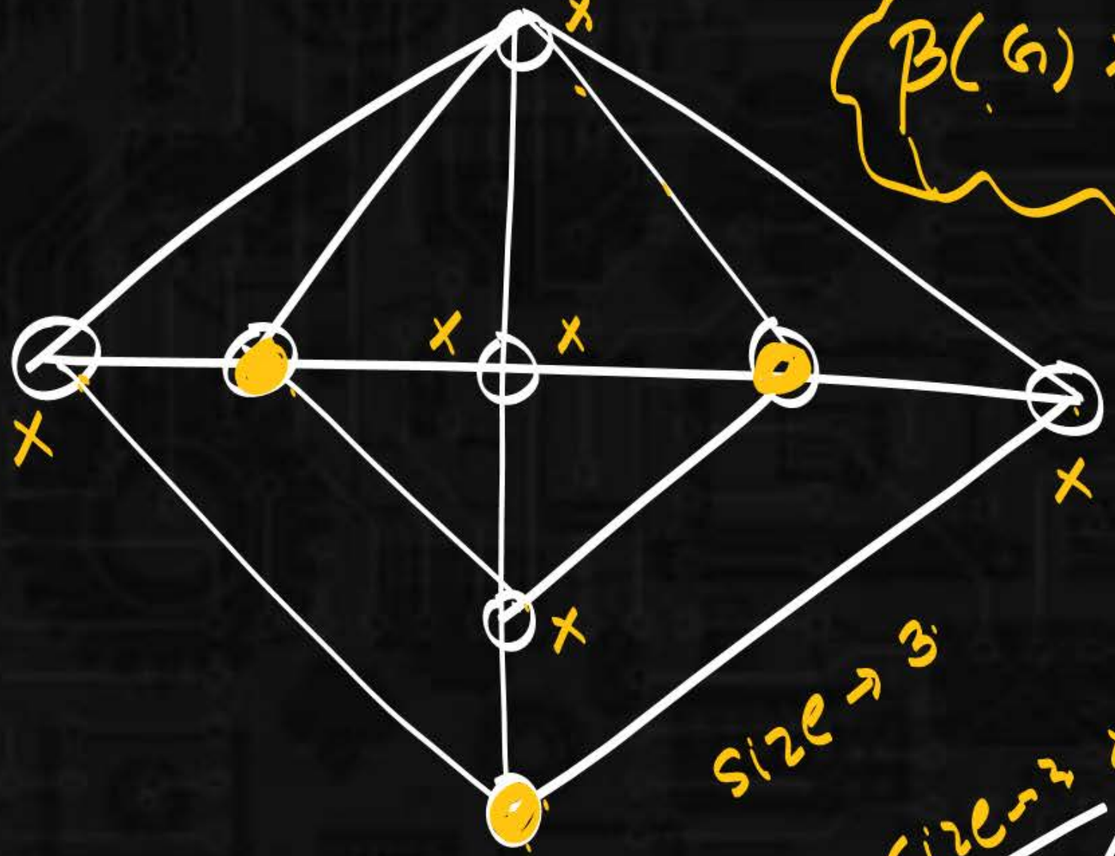


MIS → MDS.

$\alpha(G) \leq \beta(G)$.

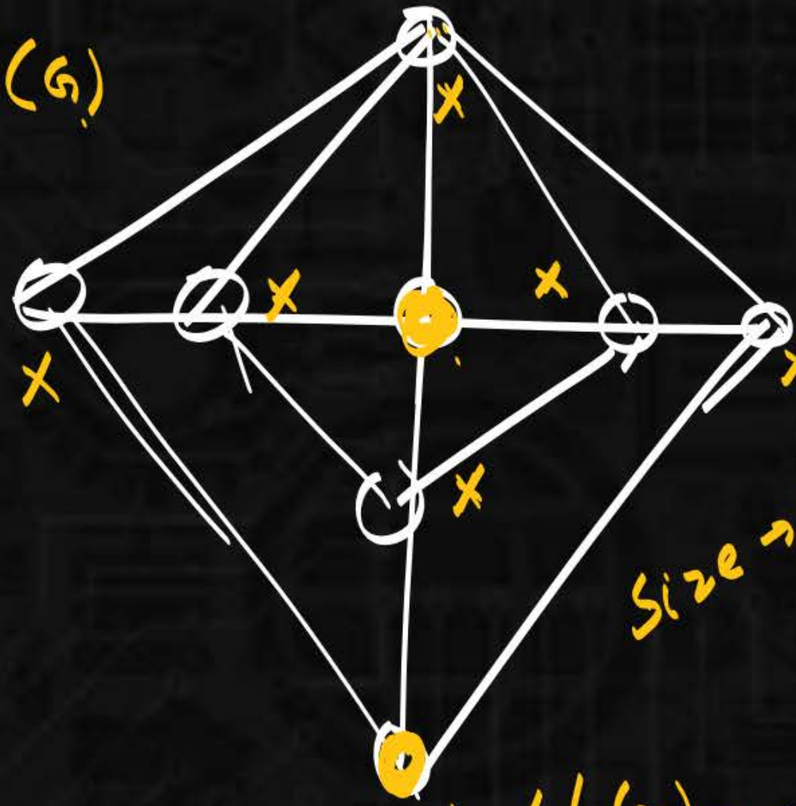
□

$\beta(G) \geq n/k$ $\beta(G)$



size → 3

$\beta(G) = 3.$

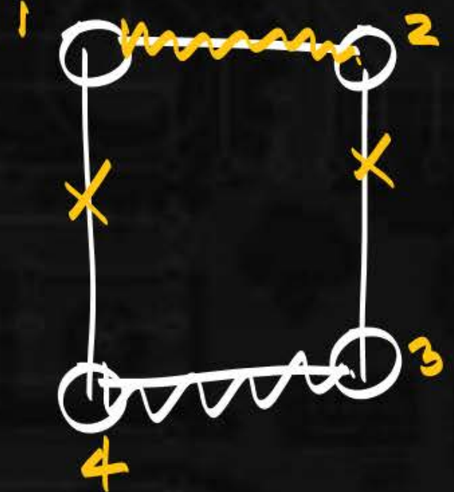


size → 2

$\alpha(G) = 2.$

$\beta(G) = 3.$

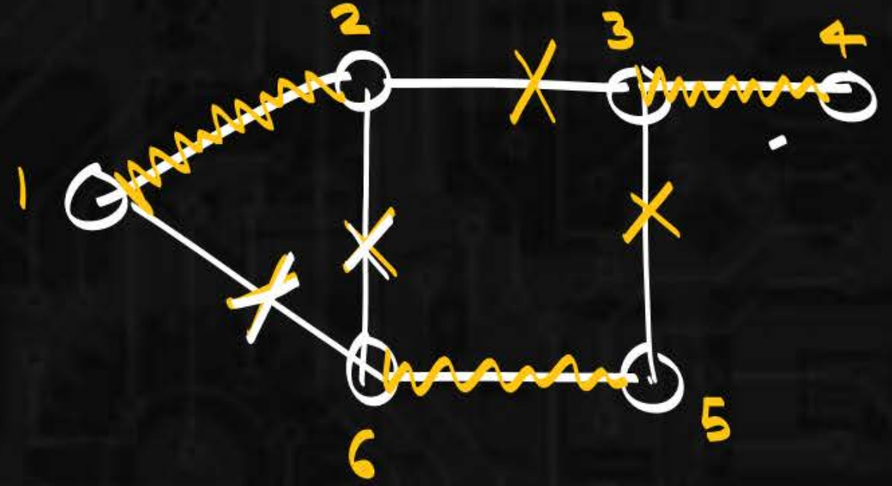
Independent edge set : set of non adjacent edges.
matching set



{12} – ms.

{12, 34} → ms.

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

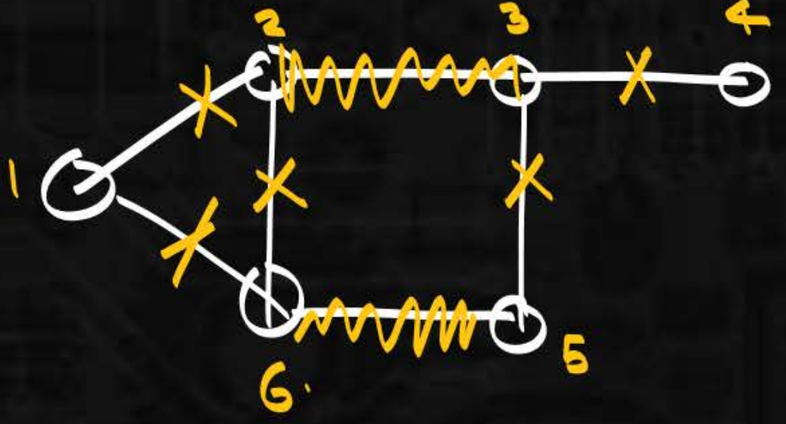


{34} — ms.

{34, 65} → ms.

{34, 65, 12} → maximal matching set.

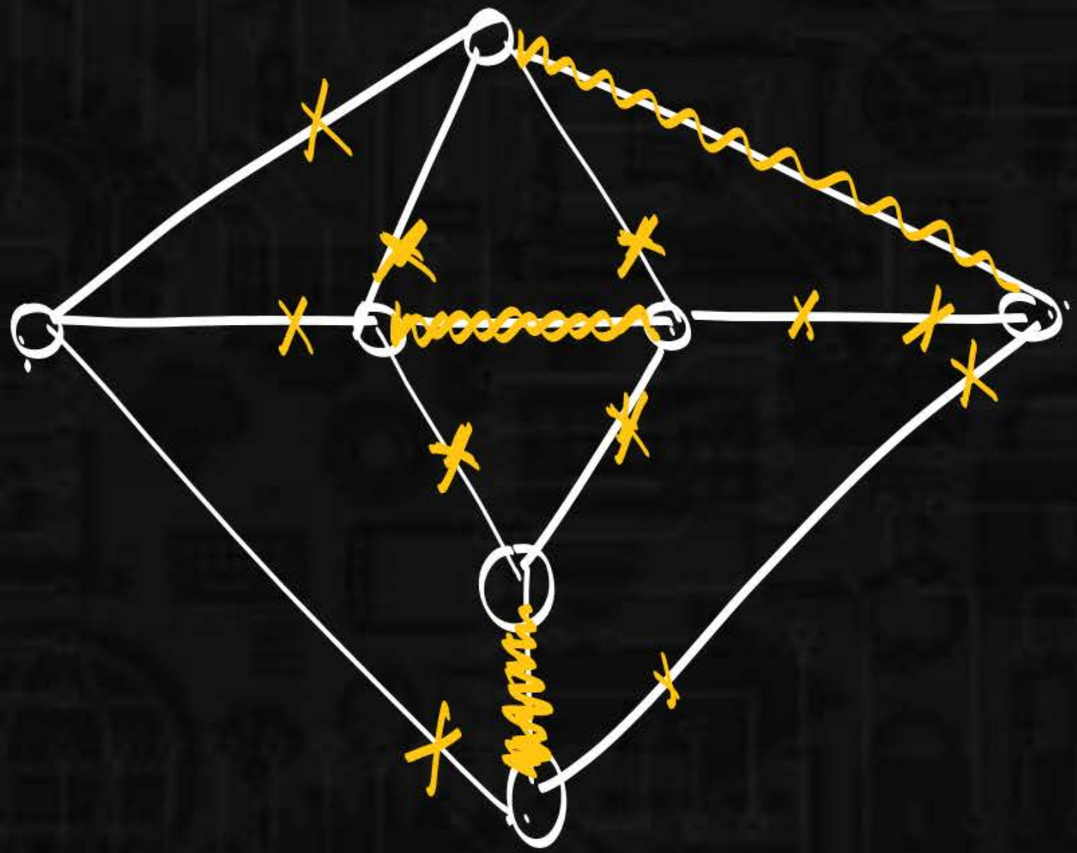
...

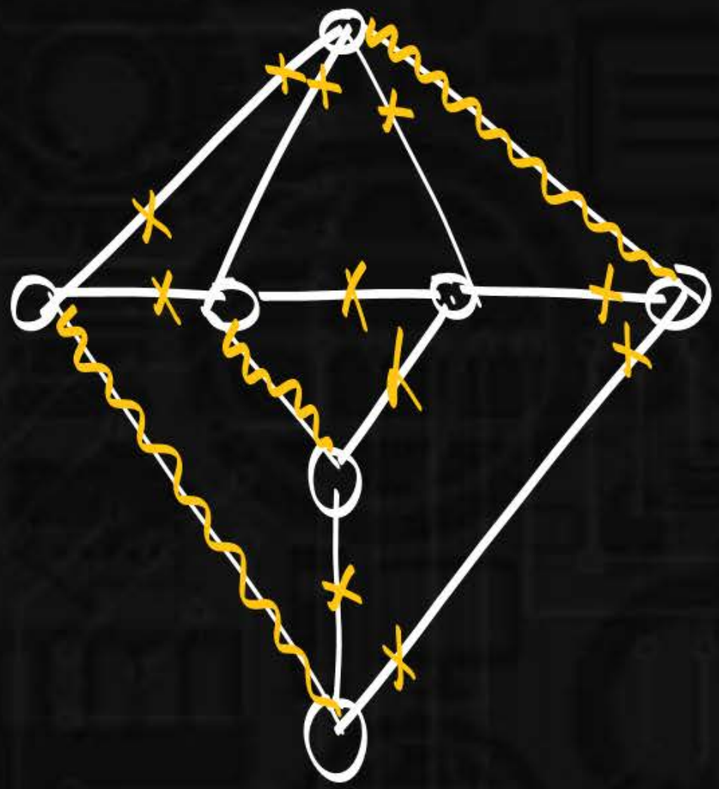


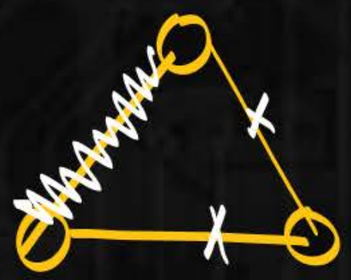
{23}

{23, 65} — maximal matching set.

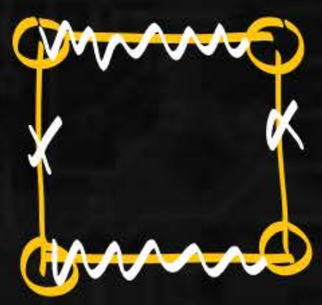
matchingno(m(G)): no of edges present in largest maximal matching set.



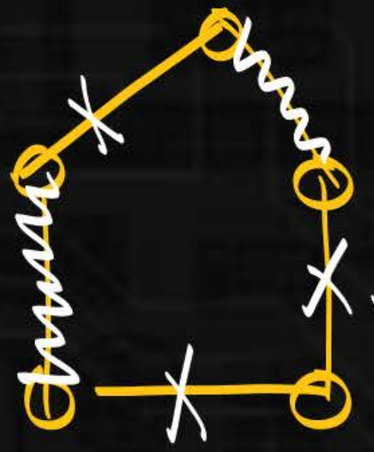




$m(C_3) = 1$



$m(C_4) = 2.$



$m(C_5) = 2$

$3 \rightarrow 1.$

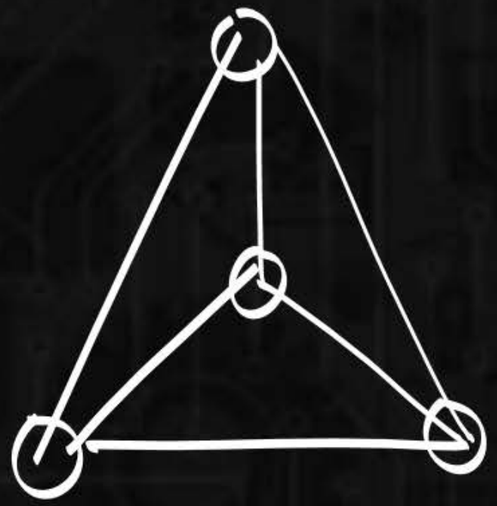
$4 \rightarrow 2.$

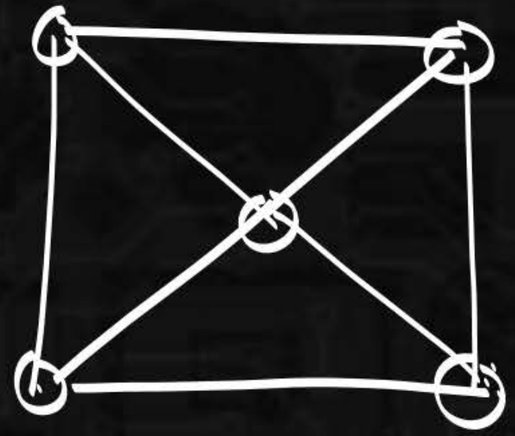
$5 \rightarrow 2$

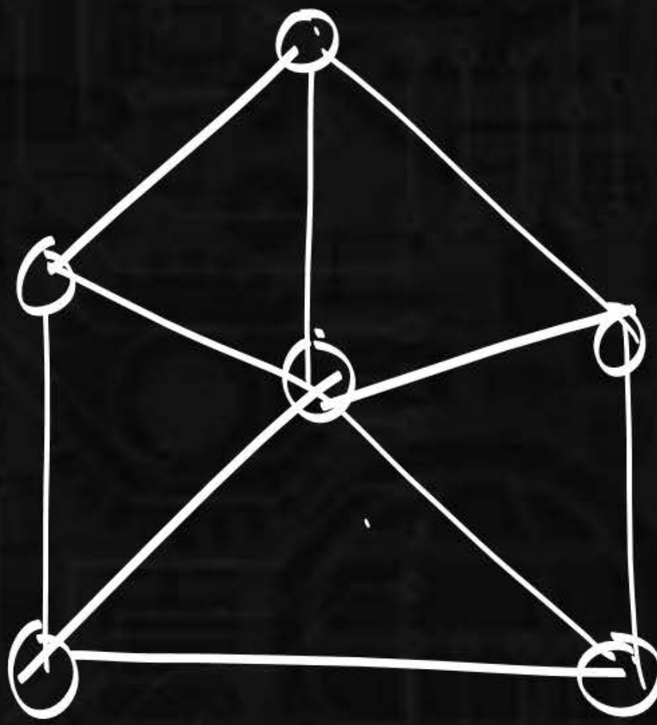
$$m(C_n) = \left\lfloor \frac{n}{2} \right\rfloor$$

$m(W_n)$

$m(K_n)$







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

$$m(k_n) = m(\omega_n) = m(c_n) = \left\lfloor \frac{n}{2} \right\rfloor$$


THANK YOU GW
SOLDIERS !