Hall's Theorem.

Def:

Let G be a bipartite graph with bipartition (X, Y). Then G contains a matching that saturates every ~~very~~ vertex in X if and only if $|N(S)| \geq |S|$ for all $S \subseteq X$

$G \begin{cases} X - x(S) & x \subseteq m \\ Y \end{cases}$

Proof:-

Let us assume that G contains a matching M which saturates every vertex in X.

To prove:- $|N(S)| \geq |S|$

Let S be a subset of X.

a → 1
b — 1, 2, 3
c — 3, 4
D — 4

matching where no edge share the same vertex.

$2^3 = 2^3 = 8$

a → 1
b → 1, 2
c → 3

8

$|S| = \{a\}$

$|S| = 1$

$S(N) = \{1\}$

$S(N) = 1$

$1 = 1$

a → 1
b → 2

perfect matching

$n\,2 = 2^2 = 16$

a → 1
b → 2
c → 3
D → 4

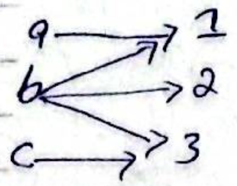
$\{\}, \{a\}, \{b\}, \{c\}$

$\{a, b\}, \{a, c\}, \{b, c\}$

$\{a, b, c\}$

a b c
1 2 3

=> Hall's Marriage theorem



Now step 1

~~NO~~ it is Matching becuse intially hmy Matching nh mili hue hogi phr humy identify karna hoga ke either yai Hall's Marriage theorem ko satisfy ker sha hai ya nh.

So step 2. → Make the subset

$2^n = 2^3 = 8$.

{ }, {a} {b}, {c}, {a, b}, {a, c}, {b, c}
{a, b, c}

so Now step 3.

$|N(S)| \geq |S|$

for that

tak

(S) = {a} means hang vertex 1

Now

S(N) = 1 ta uha a connected kettan

saan aly. 1 sai hai.

so

$\boxed{\begin{array}{c} S(N) \geq S \\ 1 \geq 1 \ \text{satisfied} \end{array}}$

Now

$(S) = \{b\}$ which is vertex 1

For $S(n) = 3$

So

$S(n) \geq S$

$3 \geq 1$

Hence proved and same for other.