তারিখ ঃ

$$\cancel{y = \frac{\sqrt{x+2}}{x^2-9}}$$

$$\Rightarrow \cancel{(x^2y - 9y)^2 = (\sqrt{x-2})^2}$$

1st tutorial

1. a)

Set: A set is an unordered collection of different element. A set can be written explicity by listing its elements using set bracket. Example,

i) A set of all positive integers.

ii) Set of all state in India.

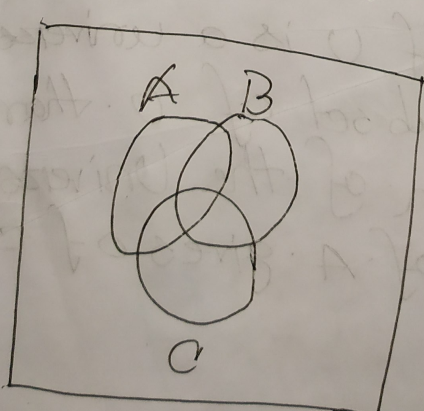
Complement:- If U is a universal set and A be any subset of U than the difference between of the Universal set U and the subset of A gives of complement of A' set.

<u>Cardinality</u>: Cardinality of set S is denoted by |S|. the total number of distinct elements of the set.

<u>Partition</u>:- A partition of a set is a grouping of its element into non-empty subsets.

<u>finite set</u>:- finite sets are the sets having a finite/countable number of members.

Here, A, B, C are finite sets



তারিখ ঃ

$\therefore n(A\cup B\cup C) = n[(A\cup B)\cup C]$

$= n(A\cup B) + n(C) - n[(A\cup B)\cap C]$

$= n(A) + n(B) - n(A\cap B) + n(C) - n[(A\cap C)\cup(B\cap C)]$

$= n(A) + n(B) + n(C) - n(A\cap B) - n(A\cap C) - n(B\cap C)$
$+ n(A\cap B\cap C)$

$[\because$ where, $n(A\cap B)\cap n(A\cap C) = n(A\cap B\cap C)]$

$\therefore n(A\cup B\cup C) = n(A) + n(B) + n(C) - n(A\cap B) - n(A\cap C)$
$- n(B\cap C) + n(A\cap B\cap C)$

1.(b) prove that,

i) $A\cup A = A$

Suppose, $A = \{1,2,3\}$

$L.S = A\cup A = \{1,2,3\}\cup\{1,2,3\}$
$= \{1,2,3\}$
$= R.S$

$\therefore L.S = R.S$ (Proved)

ii) $A\cap A = A$

Suppose, $A = \{3,5,6\}$

$\therefore A\cap A = \{3,5,6\}\cap\{3,5,6\}$
$= \{3,5,6\}$
$= R.S$

$\therefore L.S = R.S$ (Proved)

তারিখ ঃ

1(a)

$f(x) = \frac{\sqrt{x-2}}{x^2-9}$

$x-2 \geq 0$ | $x^2-9 > 0$

$\Rightarrow x \geq 2$ | $= (x+3)(x-3) \geq 0$

$-3 \quad 0 \quad 2 \quad 3$

$Dom = [2, 3) \cup (3, \infty)$

$Range = [0, \infty)$

তারিখ :

1. (d)

$Q = \{x : 2x - 3 < 11, x \text{ positive integer}\}$

$2x - 3 < 11$

$\Rightarrow 2x < 14$

$\Rightarrow x < 7$

$\therefore Q = \{1, 2, 3, 4, 5, 6, 7\}$

1 2
3 4 5
6

1(c)

$f(x) = \frac{\sqrt{x-2}}{x^2 - 9}$

$\therefore$ dom, $x^2 - 9 \neq 0$

$\Rightarrow x^2 \neq 9$

$\Rightarrow x \neq \pm 3$

$x - 2 \geq 0$

$\Rightarrow x \geq 2$

$-3 \quad 2 \quad 3$

$\therefore$ dom, $R - \{\pm 3\}$

Set $[-3, 2)$

তারিখ ঃ

2(b) Here,
M for Mathe subject, H for history subject, P for physics subject.

$n(M) = 35$ $\quad n(M \cap H) = 20$

$n(H) = 37$ $\quad n(M \cap P) = 14$

$n(P) = 26$ $\quad n(H \cap P) = 3$

$n(M \cap H \cap P) = 2$

~~$n(M) + n(H)$~~

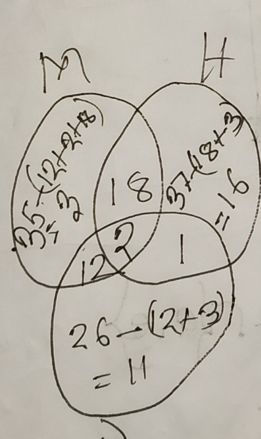
~~$37 + 18 + 16$~~

c) ~~$M \cap H$~~

$n(M \cap H) - n(M \cap H \cap P)$

$= 20 - 2$

$= 18$



b) $n(M \cup P \cup H) = 35 + 37 + 26 - 20 - 14 - 3 + 2$

$= 63$

$n(\overline{M \cup P \cup H}) = n(U) - n(M \cup P \cup H)$

$= 85 - 63$

$= 22$

a) $n(M \cup P) = n(M) + n(P) - n(M \cap P)$

$= 35 + 26 - 14$

$= 61 - 14$

$= 47$

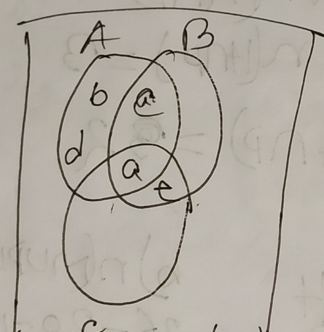
তারিখ ঃ

2/c)

$B \cap C = \{a, e\}$

$\therefore A \cap (B \cap C) = \{a, b, c, d\} \cap \{a, e\}$

$= \{a\}$

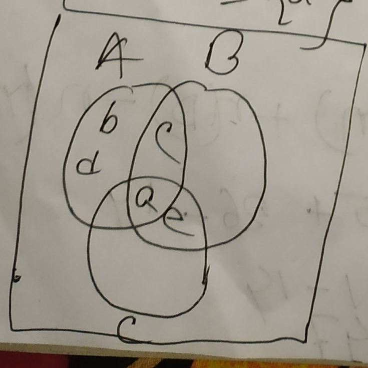


$A \cap (B \cap C) = \{a\}$

$A \cap B = \{a, c\}$

$(A \cap B) \cap C = \{a, c\} \cap \{a, e\}$

$= \{a\}$



3(a) $A = \{1, 2, 3\}$ $B = \{1, 2\}$

Relation, where here, $a \in A$, $b \in B$ and $a > b$

$= \{(2, 1), (3, 1), (3, 2)\}$

$\therefore$ Matrix representation of set,

~~1 2 3~~

~~1 2~~

~~1 2 3~~
~~1 0 0 0~~
~~2~~

	1	2
1	0	0
2	1	0
3	1	1

তারিখ ঃ

3(b) 1

$A = \{a_1, a_2, a_3\}$ $B = \{b_1, b_2, b_3, b_4, b_5\}$

	b_1	b_2	b_3	b_4	b_5
a_1	1	1	1	1	1
a_2	1	1	1	1	1
a_3	1	1	1	1	1

3(b) $A = \{a_1, a_2, a_3\}$ $B = \{b_1, b_2, b_3, b_4, b_5\}$

$$M_R = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \end{pmatrix}$$

$\therefore$ Order pair $= \{(a_1, b_2)$ $(a_2, b_1), (a_2, b_3)$ $(a_2, b_4), (a_3, b_1), (a_3, b_3), (a_3, b_5)\}$

তারিখ ঃ

3(d)

i) cardinality $= \frac{37-4}{1}+1$

$= 33+1$

$= 34$

ii) cardinality $= \frac{99-2}{1}+1$

$= 97+1$

$= 98$

iii) $A = \{1, 2, 3, \ldots \ldots 19\}$

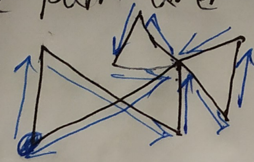
$B = \{1, 2, 3, 5, 7, 11, 13, 17, 19\}$

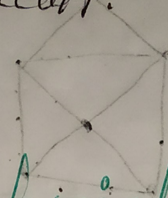
$\therefore A \cap B = \{1, 2, 3, 5, 7, 11, 13, 17, 19\}$

$\therefore$ Cardinality $= 9$.

তারিখ :

Euler path and circuit.





2nd tutorial

1/a) vertex, $n = 10$

$$\text{edges} = \frac{10(10-1)}{2} = \frac{10 \times 9}{2} = 45$$

1 b) indegree

deg(a) =

deg(b) =

deg(c) =

deg(d) =

deg(e) =

Out degree

deg(a) =

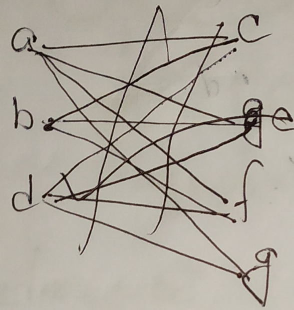
deg(b) =

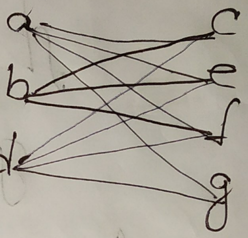
deg(c) =

deg(d) =

deg(e) =

1 (c) graph ~~Ho~~ bipartite.



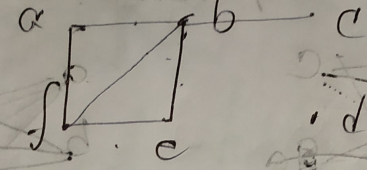


Graph G is bipartite because its vertex is the union of two disjoints set. {a, b, d} and {c, e, f, g} and each edge connects a vertex in one of these subsets to a vertex in the other subset. (Note that for G to be bipartite it is no necessary to every vertex in {a, b, d} to adjacent every vertex in {c, e, f, g} for instance b, g are not adjacent.

Graph H is not bipartite because its vertex set cannot be partitioned into two subsets so that edges do not bipartite connect two vertices from the same subset. The reader should verify this by considering the vertices a, b, and f.

তারিখ ঃ

1/d



graph-1.

vertices = 6

edges = 6

deg(a) = 2 deg(e) = 2

deg(b) = 4 deg(d) = 0

deg(c) = 1

deg(f) = $\cancel{2}$ 3

∴ isolated vertex = d

Pendent vertex = 0

Sum of degree = $2 + \cancel{2}4 + 1 + 2 + \cancel{2}3$

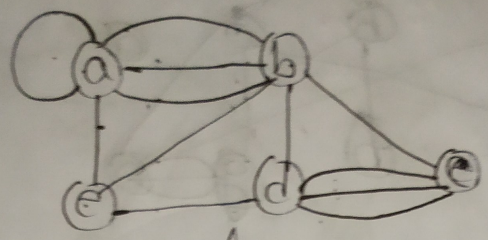
$= \cancel{9}\ 12$

∴ degree = edge × 2

= 6 × 2

= 12

তারিখ :



graph = 2

vertex = 5
edge = 12

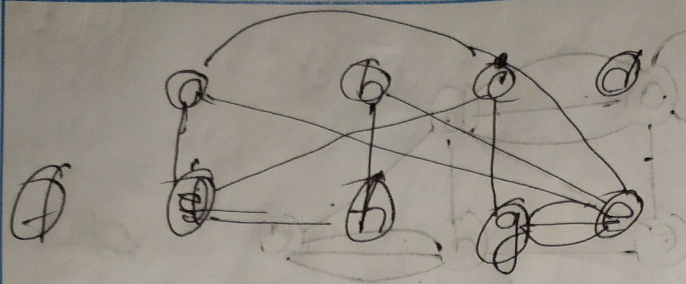
deg(a) = 6
deg(b) = 6
deg(c) = 4
deg(d) = 5
deg(f) = 3

sum of degree = 6+6+4+5+3
= 24

degree = edge×2
= 12×2
= 24

pendent vertex = 0
isolated vertex = 0

তারিখ ঃ



vertex = 9

edge = 14

deg(a) = 3

deg(b) = 2

deg(c) = 4

deg(d) = 0

deg(e) = 6

deg(f) = 0

deg(g) = 4

deg(h) = 2

deg(i) = 3

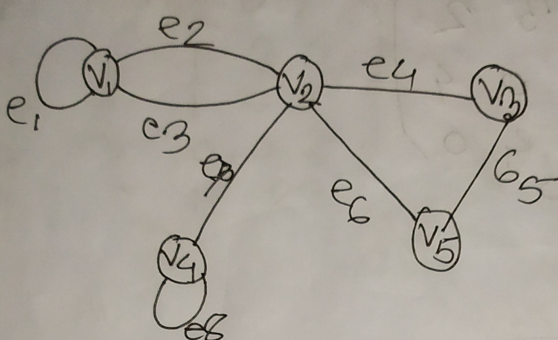
Sum of degree = 3+2+4+6+4+2+3

= 24

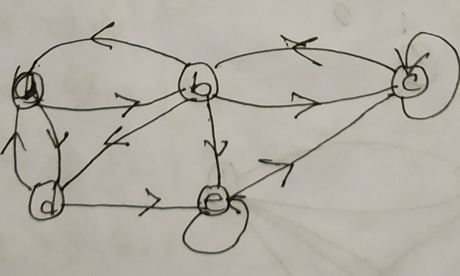
isolated = d, f

pendent = 0

2. a)



	v_1	v_2	v_3	v_4	v_5
v_1	1	2	0	0	0
v_2	2	0	1	1	1
v_3	0	1	0	0	1
v_4	1	1	0	0	0
v_5	0	1	1	0	0



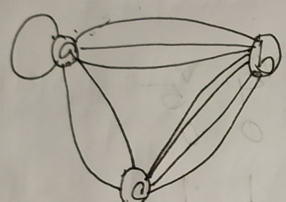
0	1	0	1	0
1	0	1	1	1
0	1	1	0	0
1	0	0	0	1
0	0	1	0	1

তারিখ ঃ

2.b)

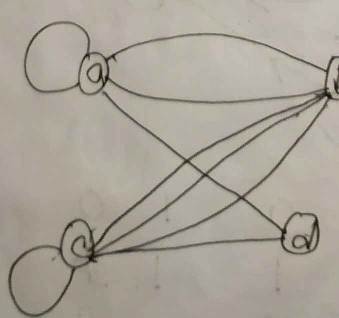
$$\begin{pmatrix} 1 & 3 & 2 \\ 3 & 0 & 4 \\ 2 & 4 & 0 \end{pmatrix}$$

P



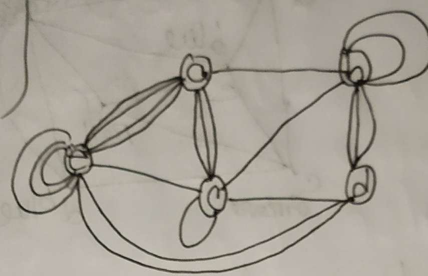
$$\begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

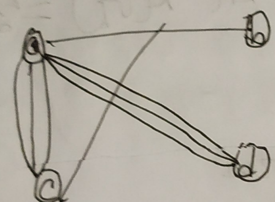
Q



$$\begin{pmatrix} 0 & 1 & 3 & 0 & 4 \\ 1 & 2 & 1 & 3 & 0 \\ 3 & 1 & 1 & 0 & 1 \\ 0 & 3 & 0 & 0 & 2 \\ 4 & 0 & 1 & 2 & 3 \end{pmatrix}$$

R





2. c) for graph A_1

vertex = 6

edge = 9

$deg(u_1) = \cancel{3}\ 2,1$

$deg(u_2) = \cancel{3}\ 2,1$

$deg(u_3) = \cancel{3}\ 1,2$

$deg(u_4) = \cancel{3}\ 2,1$

$deg(u_5) = \cancel{3}\ 1,2$

$deg(u_6) = \cancel{3}\ 1,2$

for graph A_2

vertex = 6

edge = 9

$deg(v_1) = 1,2$

$deg(v_2) = 2,1$

$deg(v_3) = 1,2$

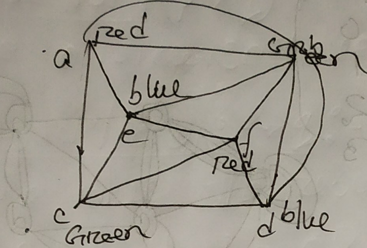
$deg(v_4) = 2,1$

$deg(v_5) = 2,1$

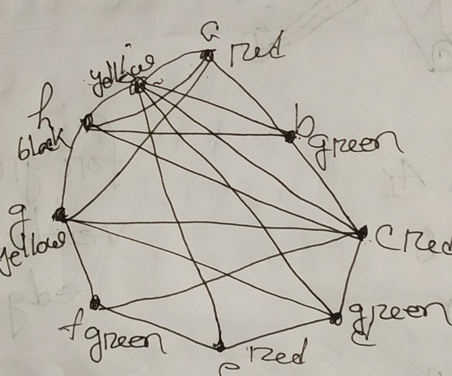
$deg(v_6) = 1,2$

isomorphic

2. d/



chromatic number $\chi(G) = 3$



$\chi(G) = 5$

3.(a) i)

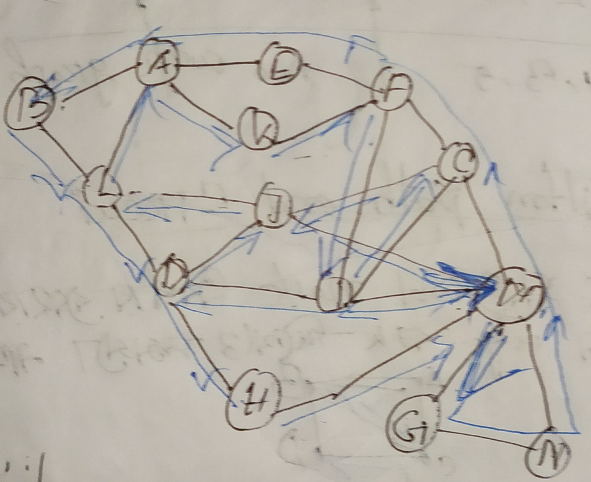
where,

vertex = 14

edge = 23

Odd degree of vertex number = 0

So. this graph have euler circuit.



3(a) ii)

Graph E-2 is not Hamilton

Because vertex E has only ~~two~~ ~~one~~ two degree. (hamilton cycle হলে যে vertex থেকে visit করা শুরু হবে আবার ঐ vertex এ শেষ হবে)

তারিখ ঃ

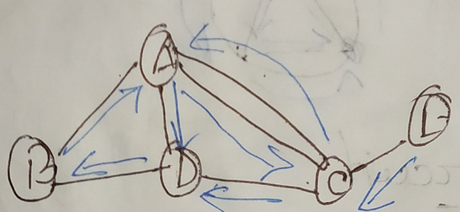
3(b) graph G_2.

vertex = 5

edge = 7

~~eve~~ odd number of ~~edge~~ vertex degree = 2

A graph has an euler's path when this graph has only 2 or 0 vertex has odd degree.



But there are odd number of degree of the vertex number 2. So, this graph has no euler path.

3(c)

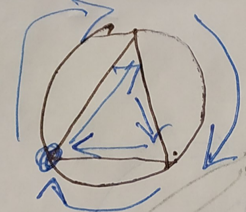
vertex = 3

edge = 6

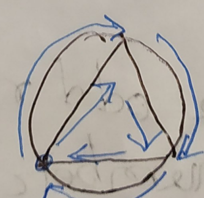
odd number of vertex = 0

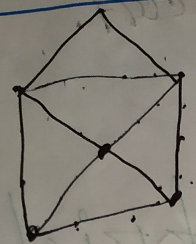
so this graph has euler circuit and euler path.

Euler path:

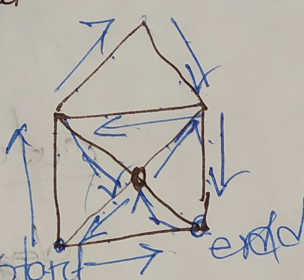


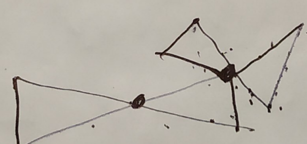
Euler circuit





vertex = 6
edge = 10
odd number of edge = 2
So, this graph has euler path but not euler circuit.





vertex = 9
edge = 12
odd number of vertex = 0
So, this graph has euler path and circuit also.