Module - II

(Q) Let G be the graph. define the terms :
a) walk
b) Trail
c) Path
d) closed walk

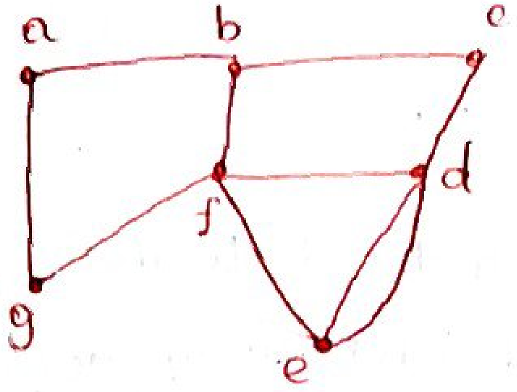
1) Walk : A walk in a graph is a sequence of vertices where each adjacent pair of vertices is connected by an edge. The walk can revisit the vertices and edges.

2) Trail : Trail in a graph is a walk where no edges are repeated

3) Path : Path in a graph is a trail where no vertex are repeated.

4) closed walk : closed walk is a walk where the walk start and end at the same end.

1.(ii)




(1) (Find a trail that is not a path) from a to c :

Tral from a to c : a - g - f - e - d - c

2) a path from a to c :

path a to c : a - b - c

3) a circuit starting at b :

circuit : A circuit is a trail with closed
(or)
A closed trail is a circuit

circuit : b - f - d - c - b

4) a cycle starting at b :

cycle : A closed path is called cycle

cycle at b : b - f - a - b

3Q) define Eulerian circuit?

Eulerian circuit:

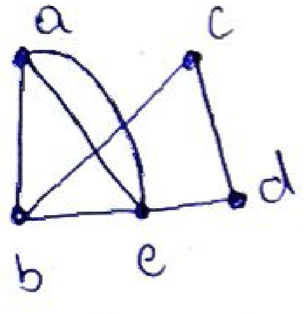
Eulerian circuit is a closed trail with all edges covered ~~at~~ only once and every vertex of the have even degree

(or)

A Graph G is called a Euler graph if it contains Eulerian circuit.

Ex: Graph (G) $V(G) = \{a, b, c, d, e\}$

$E(G) = \{ab, ae, bc, cd, de, ea, eb\}$.




a) Walk : a-b-e-a-e-d-c-b-a

b) Trail : a-b-c-d

c) Path : a-b-e-d-c

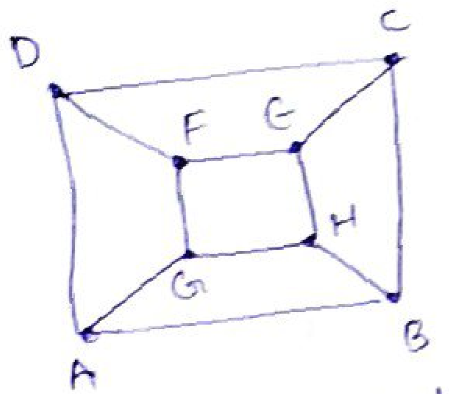
67) Example of graph having hamilton cycle yet not a Eulerian & circuit?

Hamilton cycle: (or) Hamiton circuit

* each vertex of the graph will be visited exactly once except start ~~and end~~ vertex

* start & end vertex must be same.

Ex:




Not euler graph degrees are odd

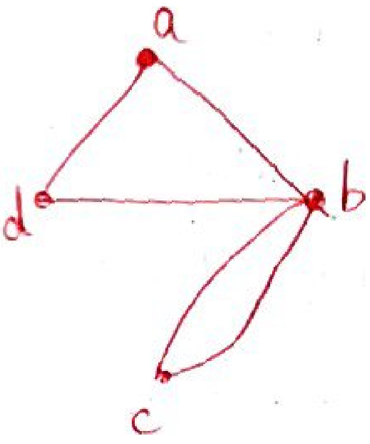
H cycle: A - B - C - D - F - E - H - G - A

68) Hamilton cycle (or) Graph?

70)

3c) do they have hamiton cycle & Eulerian circuit?

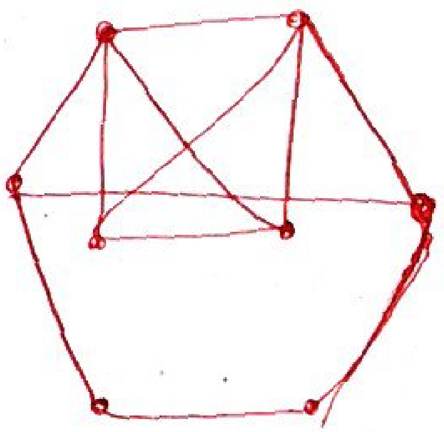
1)




hamiton: No, because there is no way to visit every vertex exactly once

Eulerian: No, because all vertex no evendegree

2)



hamiton: Yes, can cover all vertex at once

Eulerian: not all vertex have even degree

9 k)

10Q

11Q). 2 application's of Eulerian circuit?

A) Circuit designing and Elelectrical engineering.

: used in designing circuits where every component connection (such as. wires, resistor, capacitor) is visited exactly once

* It reduces erros & minimize redundacies

2) Genomics and DNA sequencing.

* The use to Identify overlaps and connections b/w DNA segments

12Q) define Hamilton path, circuit?

A) Hamiton path:

Hamiton path in a graph G is a path that visits every vertex exactly at once but unlikely cycle 'don't need to return to the starting vertex.

Halmiton cycle:

also know as circuit that visit every vertex exactly once and returns at starting of G vertex

Q) Eulerian circuit focus on traversing edges exactly once?

14Q) define the following for graph G?

1) cycle
2) circuit
3) length

cycle: A cycle in a graph G is a closed path that start and ends at the same vertex
(or)
A cycle in a graph is a sequence of vertices where first and last vertices are same, and each pair of consective vertices are connected by an edge

circuit: A circuit in a graph is defined as a closed trail that starts and ends at the same vertex.

(or)

A circuit is a sequence of vertices where the first and last vertices are same.

Length: The length of a path or a cycle in a graph refers to the total no of edges taken along the path.

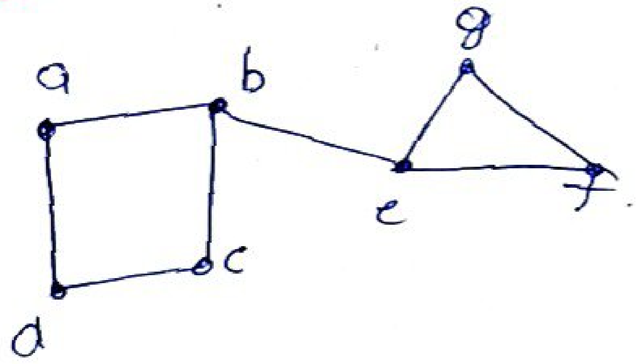
(iii) define a connected graph?

connected graph: A graph G is said to be a connected graph if there exists a path b/w every pair of vertices.

disconnected graph:

A graph G is said to be a disconnected graph, if it does not contain at least two connected vertices

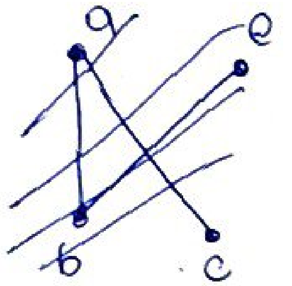
Ex:

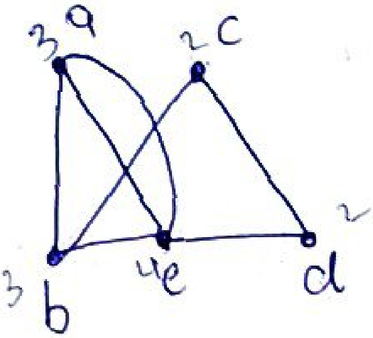


Part-B

1Q) Graph G. $V(G) = \{a, b, c, d, e\}$
and edge $E(G) = \{ab, ae, bc, cd, de, ea, eb\}$

a) Draw Graph.




b) Is G connected:

Yes

c) Is G simple?

~~Yes~~ No

d) degree of each vertex?

vertex a = 3

b = 3

c = 2

d = 2

e = 4

c) edges incident to b ?

A) {be, be, ba)

d) neighbours of a

a = {b, e}

g) walk, trail, path in G of even length 3

walk from a : a-b-c-d

trail from a : a-e-d-c-b

path from ~~b~~ : b-c-d-e-a

h) closed walk, circuit, and cycle in G . start at 'e'

closed walk e : e-a-b-e

circuit c : e-d-c-b-e

cycle e : e-a-b-c-d-e

i) Is G eulerian, semi eulerian, (or) neither

Graph G is not eulerian but it is semi eulerian because not all vertices are even degree and There exist a trial

semi euleria : They have (2 vertices) with odd degree and It is open trial we dont get to where we start. and must start at odd degree vertex

2Q)

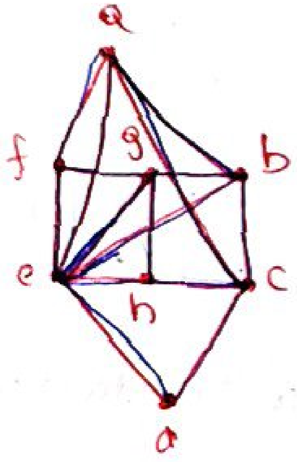
a) photographer: Eulerian circuit / trail

b) salem : "

c) Flowers : Hamilton cycle / path

3Q)

a)




degree → a = 4 f = 3
b = 4 g = 4
c = 4 h = 3
d = 2
e = 6

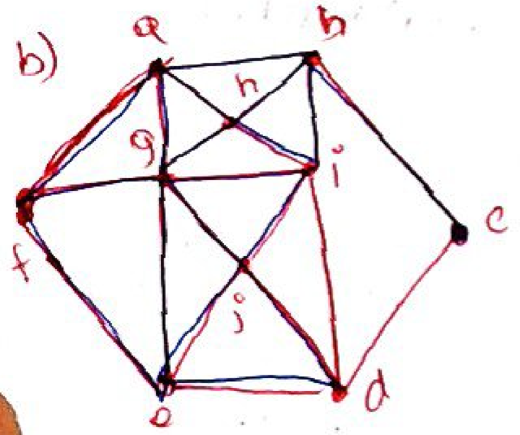
b) semi eularian

c) a semi eularian graph doesn't contain Eulerian circuit but it contains trail

eularian trial:

f - a - b - c - d - e - h - c - a - e - b - g - f - e - g - h

b)




degree → a - 4 f - 3
b - 4 g - 6
c - 3 h - 4
d - 4 i - 4
e - 4 j - 4

b) semi eularian

c) eularian trial :

4Q) properties of Hamitonian Graph?

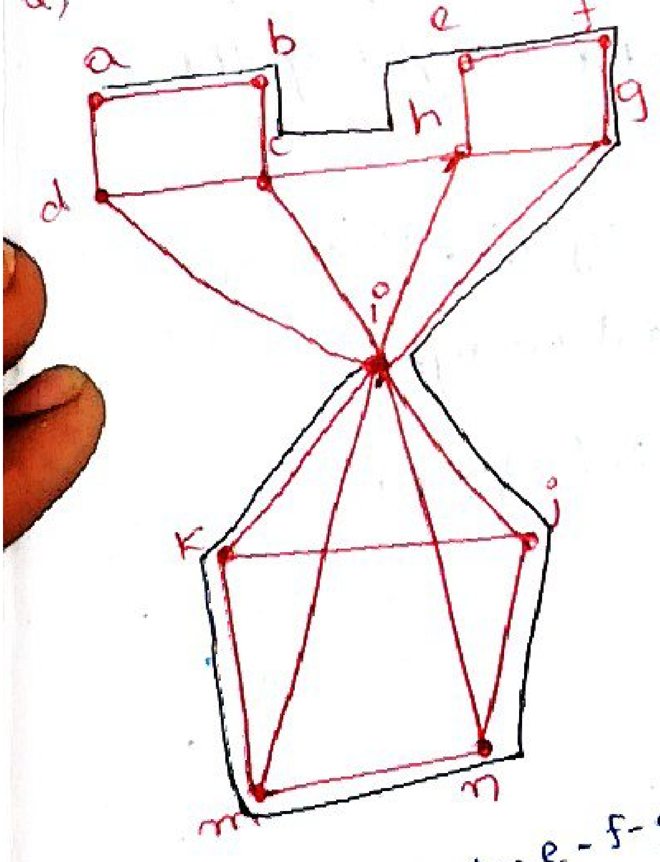
A) Hamitonian Graph:

A Graph G is said to be an Hamiltonian Graph if it contains a hamitonian cycle (or) circuit.

(or)

A Graph with closed path and covering every vertex is called Hamitonian

a)




b) also not hamitonian

cycle: a-b-c-h-e-f-g

∴ not a hamiltonian gra

5Q) Brute force Algorithm?

A) Brute force Algorithm is used in travelling sales Man Problem to find the shortest path and evaluate every possible root.

steps involved in finding path using Brute

- Input : Weighted graph Kn

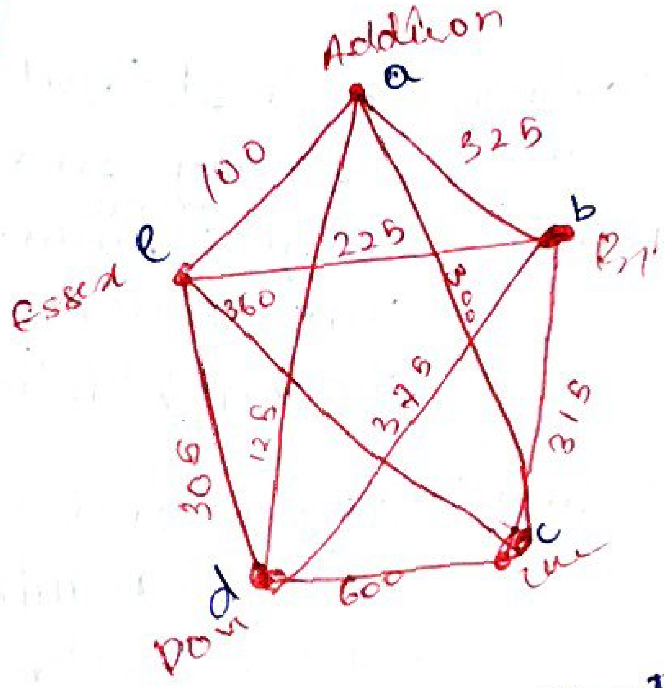
step1 : choose a starting vertex, call it v

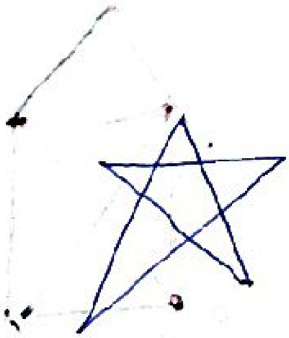
step2 : find all the hamitonian cycle from v. and calculate the total weight of the cycle

step3 : compare all (n-1) ! cycles. Pick one with the least total weight

output : Minimum weighted graph

6Q)



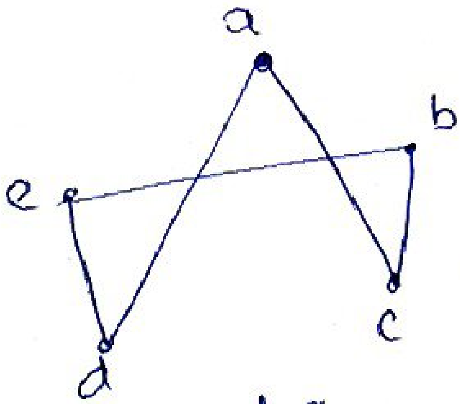
Step1: Let a be the starting vertex

① cycle: abcdea

aedcba

1645

② cycle:

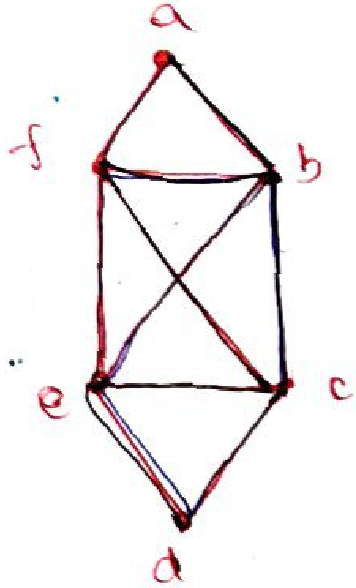



acbeda

adebca

1270

7Q)



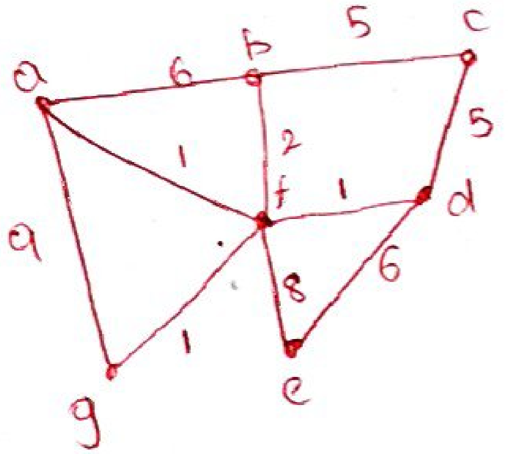

eularin circuit : closed trail covering every edge only once & having same vertex at staring & ending

Eularin trail : same as circuit but no requirement of ending & start

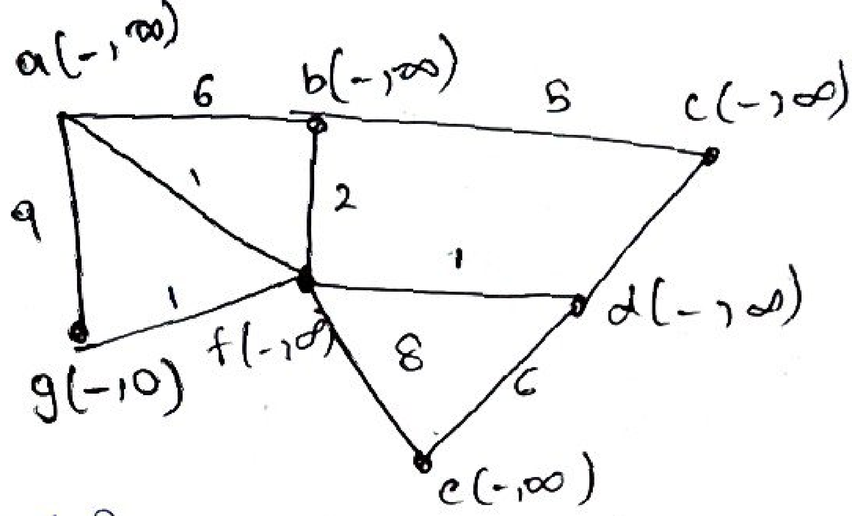
degree → a = 2  d = 2
b = 4  e = 4
c = 4  f = 4

eularin circuit : a - b - c - d - e - b - f - c - e - f - a

Q) Dijkstrai Algorithm:



A)



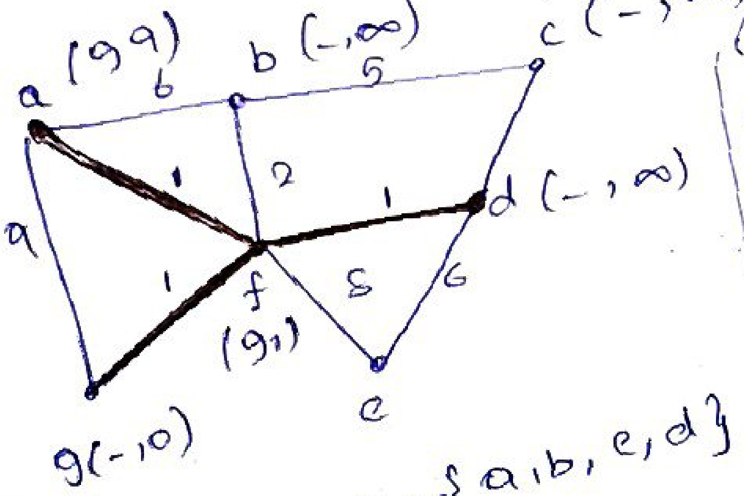

step-1 :

$F = \{a, f\}$

$w(g) + w(ga) = 0 + 9 < \infty = w(a)$

$w(g) + w(gf) = 0 + 1 < \infty = w(f)$

update $L(a) = (g, 9)$ & $L(f) = (g, 1)$




step-3

$u = a$

$w(a) + w(ba) = 2 + 6 = 8 < 2 = w(b)$

we don't update

step-4

$F = \{a, b, e, d\}$

$u = f$

$w(f) + w(fa) = 1 + 1 < 9 \Rightarrow w(a) = 2$

$w(f) + w(fb) = 1 + 2 < \infty = w(b) = 3$

$w(f) + w(fe) = 1 + 8 < \infty = w(e) = 9$

$w(f) + w(fd) = 1 + 1 < \infty = w(d) = 2$