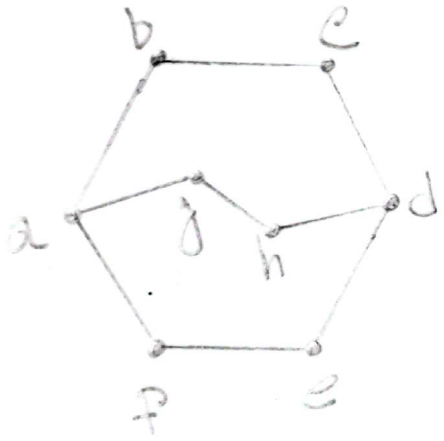
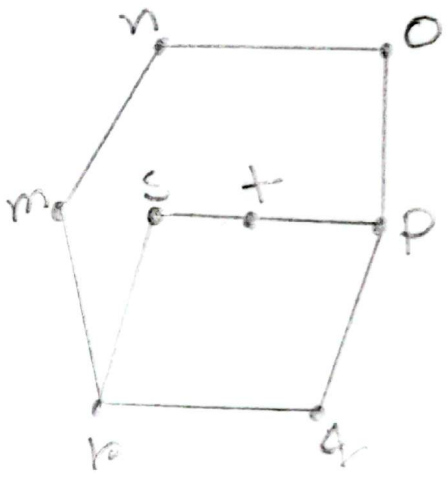
Isomorphism

Question no 1:-

Find out if the following graphs are isomorphic.



Graph- 1



Graph-2

Answer:-

Graph- 1

Vertex :- a, b, c, d, e, f, g, h (8)

Edge ⟶ 9

Degree sequence ⟶ a(3), b(2), c(2), d(3)
e(2), f(2), g(2), h(2)

Simple circuit :-

6 length simple circuit :- (a b e d g h), (a g h d f e)
(a, b, e, d, e f)

Total six length simple circuit is 3

Graph-2

Vertex → m, n, o, p, q, r, s, t (8)

Edge - 9

Degree sequence :- r(3), p(3), m(2), n(2), o(2), t(2), s(2), q(2)

Simple circuit :-

6 lenght simple circuit :- (m n o p q r)

7 length simple circuit :- (r s t p o n m)

5 length simple circuit :- (r s t p q)

Although the number of vertex, edge and Degree sequence same; the graphs are not isomorphic beause their shapes means circuit structure are different.

Graph- 1

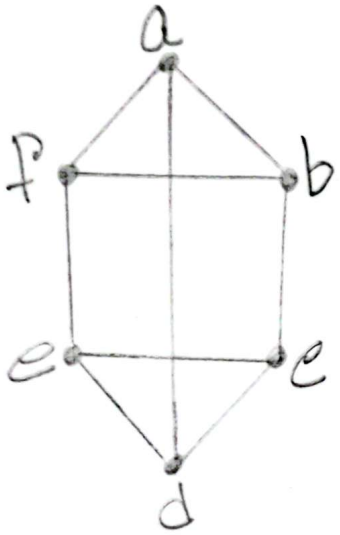
G-1	a	b	c	d	e	f	g	h
a	0	1	0	0	0	1	1	0
b	1	0	1	0	0	0	0	0
c	0	1	0	1	0	0	0	0
d	0	0	1	0	1	0	0	1
e	0	0	0	1	0	1	0	0
f	1	0	0	0	1	0	0	0
g	1	0	0	0	0	0	0	1
h	0	0	0	1	0	0	1	0

Graph- 2

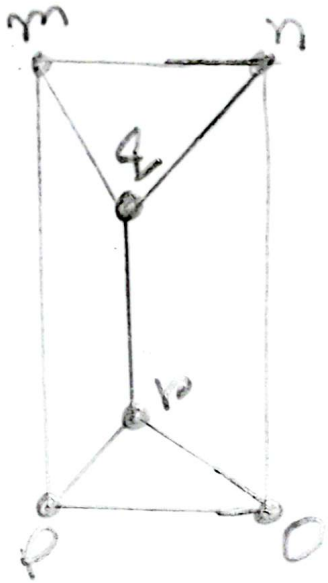
G-2	m	n	o	p	q	r	s	t
m	0	1	0	0	0	1	0	0
n	1	0	1	0	0	0	0	0
o	0	1	0	1	0	0	0	0
p	0	0	1	0	1	0	0	1
q	0	0	0	1	0	1	0	0
r	1	0	0	0	1	0	1	0
s	0	0	0	0	0	1	0	1
t	0	0	0	1	0	0	1	0

Question no 2 :-

Find out if the following graph are isomorphic



Graph-1



Graph-2

Answer :-

Graph-1

Vertex :- a, b, c, d, e, f (6)

Edge :- 9

Degree sequence :- 3, 3, 3, 3, 3, 3

Graph-2

Vertex - m, n, o, p, q, r (8)

Edge :- 9

Degree sequence :- 3, 3, 3, 3, 3, 3

Graph-1

G-1	a	b	c	d	e	f
a	0	1	0	1	0	1
b	1	0	1	0	0	1
c	0	1	0	1	1	0
d	1	0	1	0	1	0
e	0	0	1	1	0	1
f	1	1	0	0	1	0

Graph-2

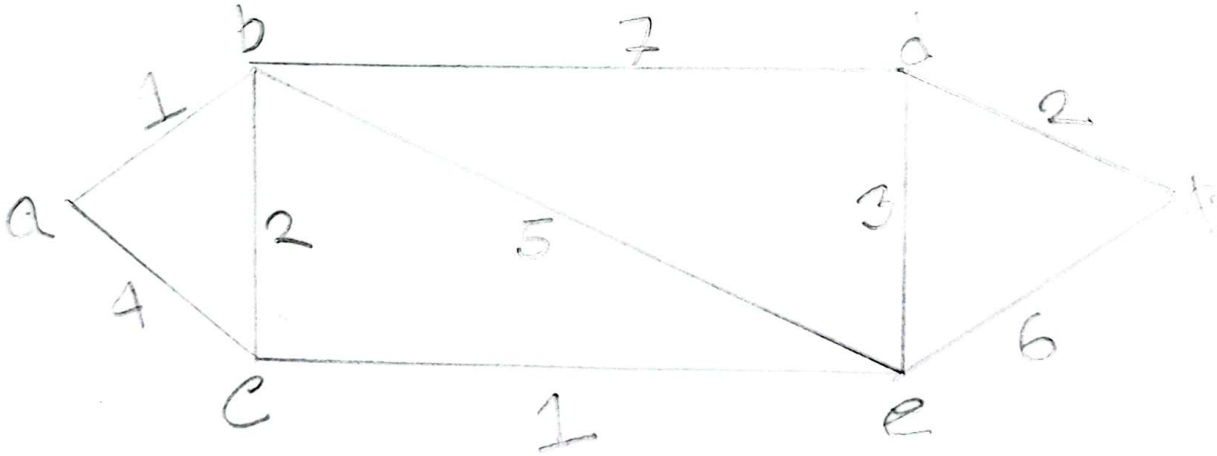
G-2	m	n	o	p	q	r
m	0	1	0	1	1	0
n	1	0	1	0	1	0
o	0	1	0	1	0	1
p	1	0	1	0	0	1
q	1	1	0	0	0	1
r	0	0	1	1	1	0

So, the two graphs are isomorphic because All the condition ~~mached~~ match.

Same numbers of vertices, same number of edges, same degree sequence.

Shortest Path Algorithm

Question 1:- Find the shortest path from a to f



Answer :-

If $L(u) + w(u,v) < L(v)$

than $L(v) := L(u) + w(u,v)$

Here,

$L(v) := \infty$ for all vertices v of G

$L(a) := 0$

$S := \emptyset$

while $z \notin S$

begin,

$u :=$ a vertex not in S with smallest $L(u)$

Now,

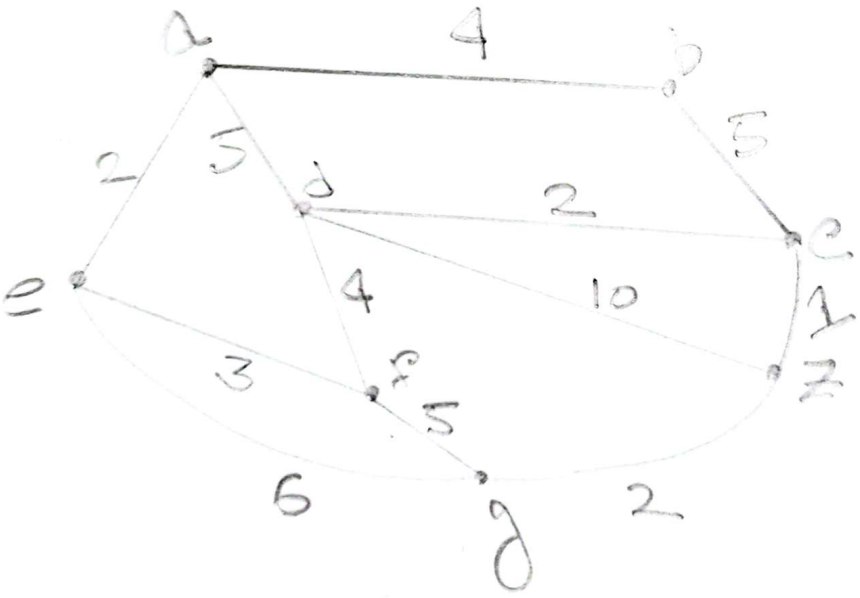
path	a	b	e	d	e	f
a	0	∞	∞	∞	∞	∞
b	0	1	4	∞	∞	∞
e	0	1	3	8	6	∞
e	0	1	3	8	4	∞
d	0	1	3	7	4	10
f	0	1	3	7	4	9

So, the shortest path for a to f in this graph is :-

$a \to b \to c \to e \longrightarrow d \longrightarrow f$.

Question no: 2

Find the shortest path from vertex a to z ?



Answer :- If $L(u) + w(u,v) < L(v)$ then $L(v) := L(u) + w(u,v)$

Here, $L(v) := \infty$ for all vertices v of G

$L(a) := 0$; $S := \phi$

while $z \notin S$

begin,

$u :=$ a vertex not in S with smallest $L(u)$.

$S := S \cup \{u\}$

	a	b	c	d	e	f	g	z
a	0	4	∞	5	2	∞	∞	∞
e	0	4	∞	5	2	∞	∞	∞
b	0	4	∞	5	2	5	8	∞
d	0	4	9	5	2	5	8	∞
f	0	4	7	5	2	5	8	15
c	0	4	7	5	2	5	8	15
z	0	4	7	5	2	5	8	8
g	0	4	7	5	2	5	8	8

so, shortest path from a to z in this graph is: a → d → e → z