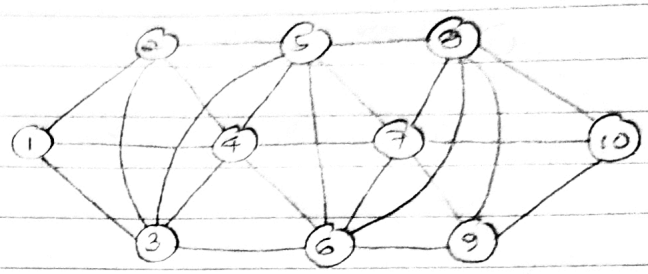
DATE:

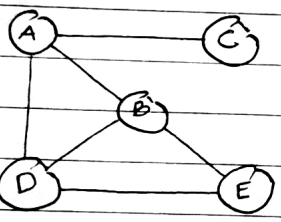
TUTORIAL 4

1. $e(G) = \{(2,1), (3,1), (3,2), (4,1), (4,2), (4,3), (5,2), (5,3), (5,4), (6,3), (6,4), (6,5), (7,4), (7,5), (7,6), (8,5), (8,6), (8,7), (9,6), (9,7), (9,8), (10,7), (10,8), (10,9)\}$



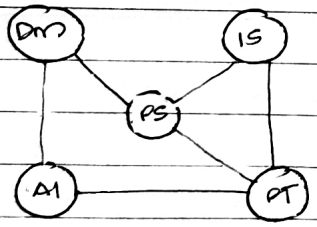
∴ number of edges = 24

2. a)



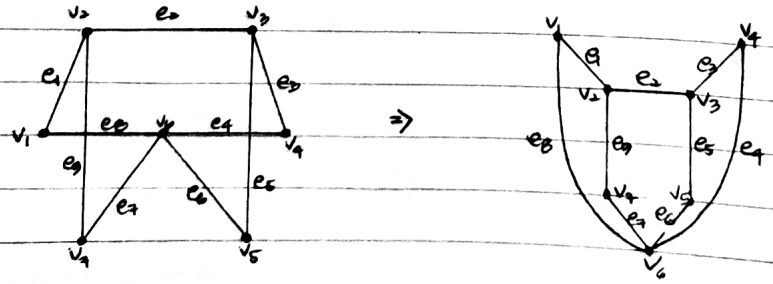
	A	B	C	D	E
A	0	1	1	1	0
B	1	0	0	1	1
C	1	0	0	0	0
D	1	1	0	0	1
E	0	1	0	1	0

b)



	Dm	IS	PT	A1	PS
Dm	0	0	0	1	1
IS	0	0	1	0	1
PT	0	1	0	1	1
A1	1	0	1	0	0
PS	1	1	1	0	0

3.



NU: .....

4. G: adjency matrix

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

incidence matrix

	e_1	e_2	e_3	e_4	e_5	e_6
v_1	2	1	1	0	0	0
v_2	0	0	0	1	0	0
v_3	0	1	1	1	1	1
v_4	0	0	0	0	1	1

H: adjency matrix

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

incidence matrix

	e_1	e_2	e_3	e_4	e_5	e_6
v_1	2	0	0	0	0	0
v_2	0	2	1	1	1	0
v_3	0	0	0	0	1	2
v_4	0	0	1	1	0	0

5. a) • Both graphs are simple and have the same number of vertices and same number of edges.

• All corresponding vertices in both graphs have same degrees.

• $f: G_1 \rightarrow G_2$ can be defined.

•

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

	u_5	u_3	u_2	u_4	u_1
u_5	0	1	0	1	0
u_3	1	0	1	0	0
u_2	0	1	0	1	1
u_4	1	0	1	0	0
u_1	0	0	1	0	0

• Both graph G_1 and G_2 are isomorphism.

b) • Both graphs are simple and have the same number of vertices and edges.

• All corresponding vertices in both graphs does not have same degrees.

• $f: H_1 \rightarrow H_2$ cannot be defined

• So, graph H_1 and H_2 are not isomorphism.

6. a) It is a trail because it has no repeated edge. Since it has repeated vertex which V_1, so it is not a path or a circuit.

b) Just walk since it has repeated e_9. Therefore, it is not a trail or a circuit.

c) It is a closed walk as the start and end is at the same vertex. Since it has no edge, this walk is not a path or circuit.

d) It is a circuit as it is a closed walk which does not contain repeated edge. Since it has repeated vertex at V_4, so it is not a path or simple circuit.

e) It is a closed walk as the start and end is at the same vertex. Since it has repeated vertices, it is not a simple circuit.

f) It is a path as it is a trail which does not contain repeated edge and vertex

7. a) 3 paths

b) 3 trails

c) Infinite walks

8. a)

Vertex	V_1	V_2	V_3	V_4	V_5
Degree	2	4	2	4	4

- This graph has a Euler circuit.
- $V_1 - e_1 - V_2 - e_2 - V_5 - e_3 - V_2 - e_4 - V_3 - e_5 - V_4 - e_6 - V_5 - e_7 - V_4 - e_8 - V_1$

b)

Vertex	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}
Degree	5	2	2	2	4	2	3	3	3	2

- This graph does not has a Euler circuit as there are 4 vertices with odd degree.

9. a)

Vertex	u	v_0	v_1	v_2	v_3	v_4	v_5	v_6	v_7	w
Degree	3	2	2	4	2	4	2	4	2	3

- This graph has a Euler path.
- $u - v_7 - v_0 - v_1 - u - v_2 - v_3 - v_4 - v_5 - v_6 - w - v_4 - v_6 - v_5 - w$

b)

Vertex	u	a	b	c	d	e	f	g	h	w
Degree	3	2	2	2	2	3	3	2	3	3

- This graph has no Euler path as other vertices other than u and w have odd degrees.

10. a) This graph has a Hamilton circuit.

$v_0 - v_7 - v_1 - v_2 - v_3 - v_4 - v_5 - v_6 - v_7$

b) This graph has a Hamilton path but not Hamilton circuit as the start and end vertices are not same and not form a circuit.

11. $n = 3$, $n = 100$

$$\frac{(n-1)n+1}{n} = \frac{(3-1)100+1}{3}$$

$$= \frac{(2)100+1}{3}$$

$$= \frac{201}{3}$$

$$= 67 \text{ ✱}$$

12. a) a

b) a, b, e, g, n, d, h, j

c) c, f, k, l, m, r, s, i, o, p, q

d) r, s

e) b

f) l, m

g) a, d, j

h) e, k, l, m, f, g, n, r, s

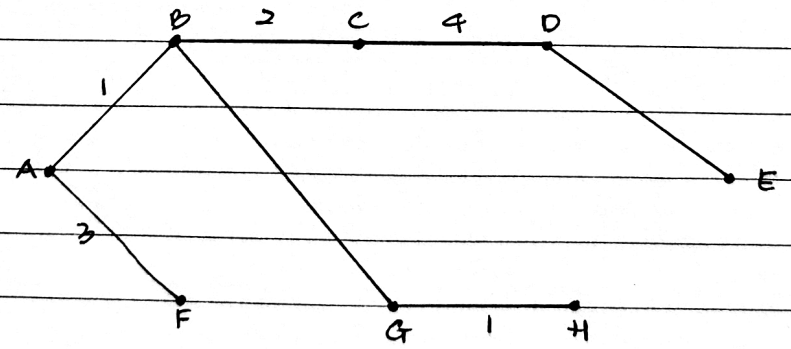
13. preorder : a, b, e, k, l, m, f, g, n, r, s, c, d, h, o, i, j, p, q

inorder : k, e, l, m, b, a, f, r, n, s, g, c, o, n, d, i, p, j, q

postorder : k, l, m, e, f, r, s, n, g, b, c, o, h, i, p, q, j, d, a

14.

AB 1	CO 4	DE 7
GH 1	BG 5	FG 8
BC 2	CG 6	HE 8
AF 3	DH 6	
BF 4	DG 7	



∴ minimum weight = 1 + 1 + 2 + 3 + 4 + 5 + 7

= 23 #

15.

No.	S	N	M	N	O	P	Q	R	S	T
1.	{}	{M, N, O, P, Q, R, S, T}	0	∞	∞	∞	∞	∞	∞	∞
2.	{M}	{N, O, P, Q, R, S, T}		4	∞	2	∞	5	∞	∞
3.	{M, P}	{N, O, Q, R, S, T}		4	∞	(2)	6	5	5	∞
4.	{M, N, P}	{O, Q, R, S, T}		(4)	10		6	5	5	∞
5.	{M, N, P, R}	{O, Q, S, T}			10		6	(5)	5	6
6.	{M, N, P, R, T}	{O, Q, S}			10		6			(6)

shortest path : M - R - T, the length is 6.