K230593

Assignment - 2

Date:

Question: 01.

1-

$$2m = \sum_{v=1}^{n} deg(v_i)$$

$m = 6$ (No of edges)

$$\sum_{v=1}^{n} deg(v_i) = deg(a) + deg(b) + deg(c) + deg(d) + deg(e) + deg(f$$

$$= 2 + 4 + 1 + 0 + 2 + 3$$

$$\sum_{v=1}^{n} deg(v_i) = 12$$

$$2m = \sum_{v=1}^{n} deg(v_i)$$

$$2(6) = 12$$

$12 = 12$ verified!

2-

$$2m = \sum_{v=1}^{n} deg(v_i)$$

$m = 13$ (No of edges)

$$\sum_{v=1}^{n} deg(v_i) = deg(a) + deg(b) + deg(c) + deg(d) + deg(e) + deg(f$$

$$= 5 + 6 + 6 + 5 + 3$$

$$\sum_{v=1}^{n} deg(v_i) = 26$$

$2m = 26$

$2(13) = 26$

$26 = 26$ verified.

3.

$$2m = \sum_{v} d(v_i)$$

$$m = 12$$

$$\sum_{v=1} deg(v_i) = deg(a) + deg(b) + \ldots\ldots\ldots deg(i).$$

$$= 3 + 2 + 4 + 0 + 6 + 0 + 4 + 2 \; 13$$

$$= 24$$

$$2m = \sum_{v=1} deg(v_i)$$

$$2(12) = 24$$

$$\boxed{24 = 24}$$ verified!

Date: _____

Question: 02

3.

Undirected edges
No multiple edges
No Loops.

8.

directed edges
All vertices has multiple edges.
vertex e and d has loops

4.

Undirected edges
Vertex a, b, d has multiple edges
No Loops.

5.

Undirected edges.
All vertices has multiple edges.
Vertex a, b, d has loops

9. Directed edges.
All vertices has multiple edges
Vertex d and f has loops

6.

Undirected edges.
All vertices has multiple edges.
~~Vertex~~ No loops.

7.

directed edges.
All vertices has multiple edges.
Vertex c and e has loops.

Date:

Question: 03 and 04

7.

$deg^-(a) = 1$, $deg^-(b) = 2$, $deg^-(c) = 1$, $deg^-(d) = 3$, $deg^-(e)$

$deg^+(a) = 3$, $deg^+(b) = 1$, $deg^+(c) = 2$, $deg^+(d) = 1$

$$|E| = \sum_{v \in V} deg^-(v) = \sum_{v \in V} deg^+(v)$$ No of vertices = 4

$7 = 1 + 2 + 1 + 3 = 3 + 1 + 2 + 1$

$7 = 7 = 7$

8.

$deg^-(a) = 2$, $deg^-(b) = 4$, $deg^-(c) = 1$, $deg^-(d) = 1$,

$deg^+(a) = 2$, $deg^+(b) = 3$, $deg^+(c) = 2$, $deg^+(d) = 1$

No of vertices = 4

$$|E| = \sum_{v \in V} deg^-(v) = \sum_{v \in V} deg^+(v)$$

$2 + 4 + 1 + 1 = 2 + 3 + 2 + 1$

$8 = 8 = 8$

9.

$deg^-(a) = 1$, $deg^-(b) = 5$, $deg^-(c) = 5$, $deg^-(d) = 2$, $deg^-(e) = 0$

$deg^+(a) = 6$, $deg^+(b) = 1$, $deg^+(c) = 2$, $deg^+(d) = 4$, $deg^+(e) = 0$

$$|E| = \sum_{v \in V} deg^-(v) = \sum_{v \in V} deg^+(v)$$

$1 + 5 + 5 + 2 + 0 = 6 + 1 + 2 + 4 + 0$

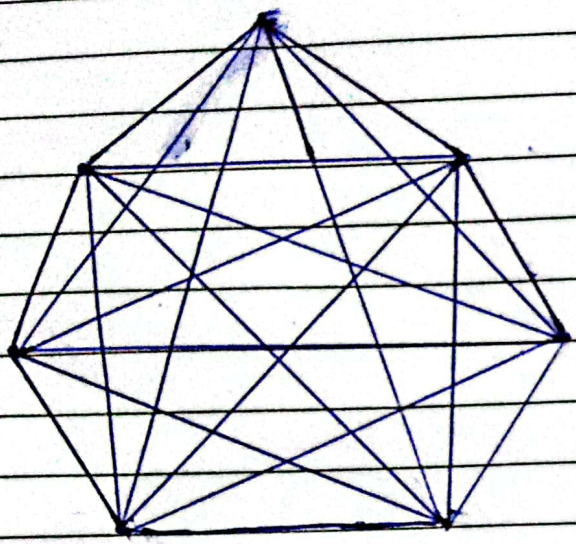
No of vertices = 5

$13 = 13 = 13$

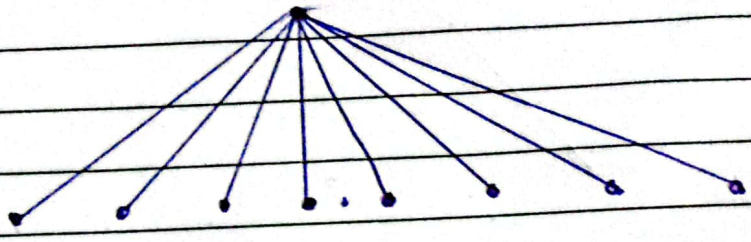
Date: _____

Question: 05

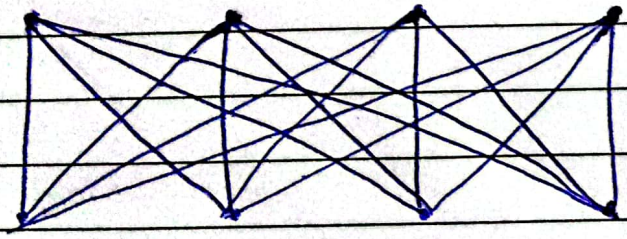
(a) K_7



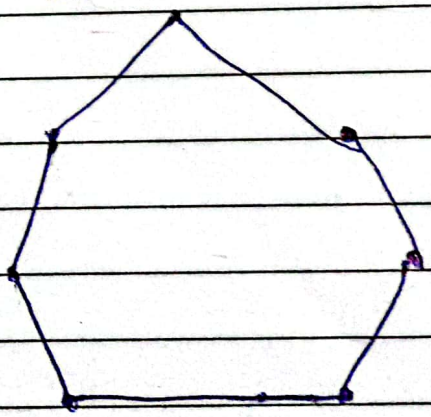
(b) $K_{1,8}$



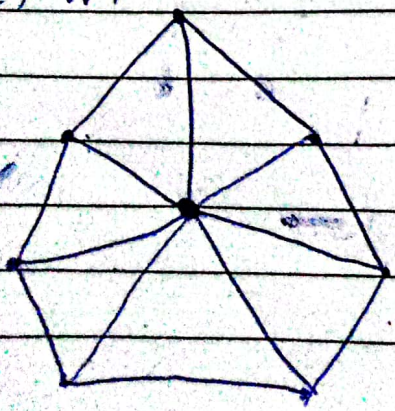
(c) $K_{4,4}$



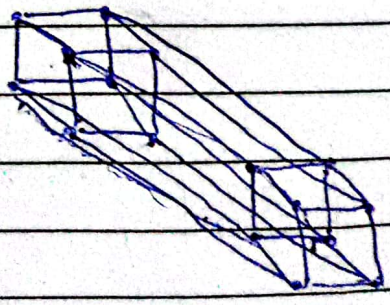
(d) C_7



(e) W_7



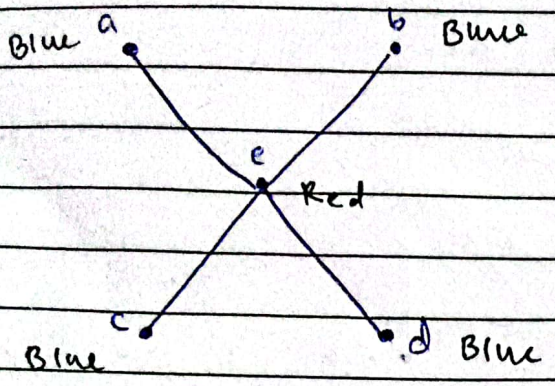
(f) Q_4.



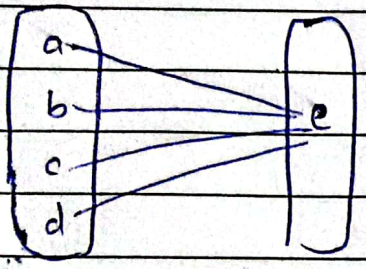
Date: _____

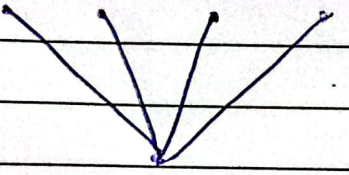
Question: 06

21.

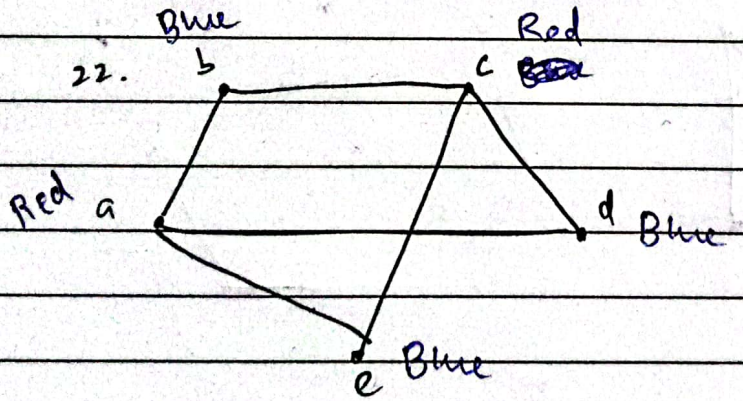


Bipartite

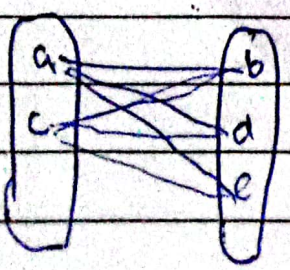


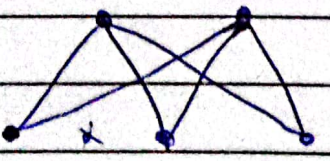


22.



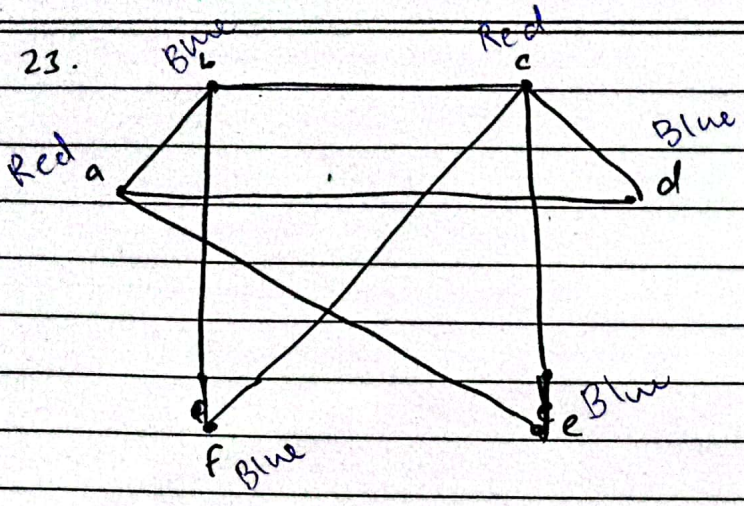
Bipartite.





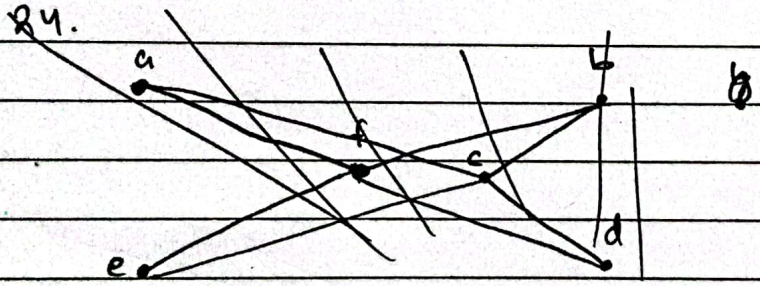
Date: _____

23.

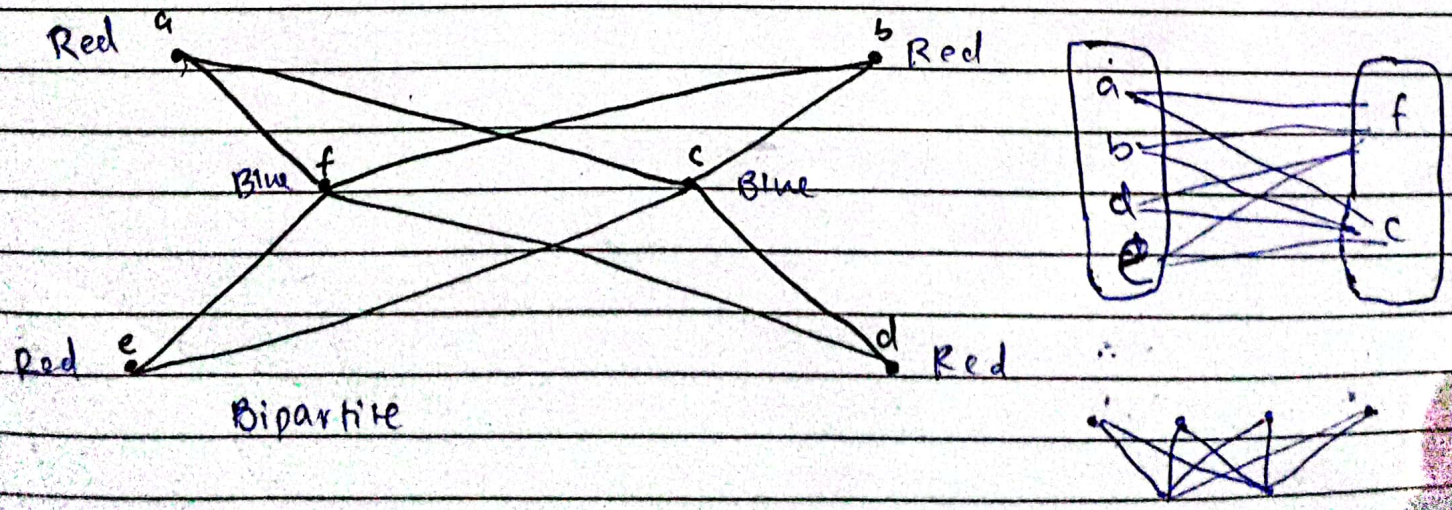


Not Bipartite

24.



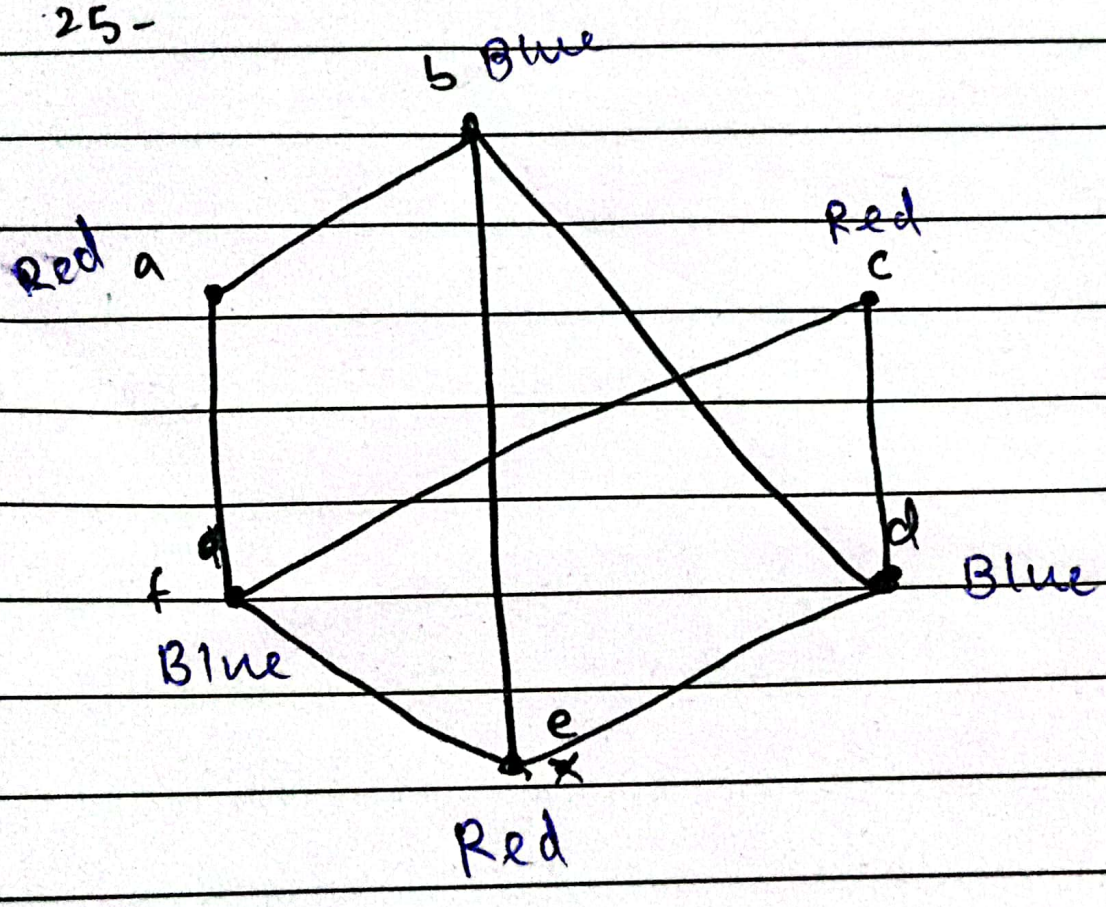
24.



Bipartite

∴

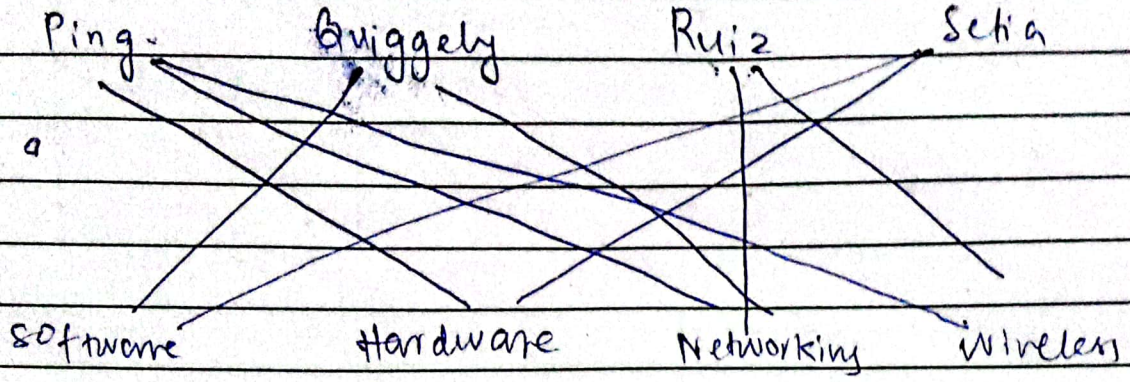
25-



Not Bipartite.

Date: _____

(a)



(b) Halls theorem : $N(S) \geq |S|$ for SCA.

- $S = \{Ping\} \rightarrow N\{Ping\} = \{Hardware, Network, Wireless\} \Rightarrow 3 \geq 1$
- $S = \{Quiggely\} \rightarrow N\{Quiggely\} = \{software, Networking\} \Rightarrow 2 \geq 1$
- $S = \{Ruiz\} \rightarrow N\{Ruiz\} = \{Networking, wireless\} \Rightarrow 2 \geq 1$
- $S = \{Sitea\} \rightarrow N\{Sitea\} = \{Sofware, Hardware\} \Rightarrow 2 \geq 1$
- $S = \{Ping, Quiggely\} \rightarrow N\{Ping, Quiggely\} = \{Software, Hardware, Network, wireless\}$ $4 \geq 2$
- $S = \{Ping, Ruiz\} \rightarrow N\{Ping, Ruiz\} = \{Hardware, Networking, wireless\}$ $3 \geq 2$
- $S = \{Ping, sitea\} \rightarrow N\{Ping, sitea\} = \{Software, Hardware, Wireless, Network\}$ $4 \geq 2$
- ~~$S = \{Ping, sitea\} \Rightarrow N\{Ping, sitea\} = \{$~~
- $S = \{Quiggely, Ruiz\} \Rightarrow N\{Quiggely, Ruiz\} = \{software, Networking, Wireless\}$ $3 \geq 2$
- $S = \{Quiggely, sitea\} \rightarrow N\{Quiggely, sitea\} = \{$ $4 \geq 2$
- $S = \{Ruiz, sitea\} \rightarrow N\{Ruiz, sitea\} = 4 \geq 2$
- $S = \{Ping, Quiggely, Ruiz\} \rightarrow N\{Ping, Quiggely, Ruiz\}$ $4 \geq 3$
- $S = \{Ping, Ruiz, Setia\} \rightarrow N\{Ping, Ruiz, Setia\}$ $4 \geq 3$
- $S = \{Ping, Quiggely, Setia\} \rightarrow N\{Ping, Quiggely, setia\}$ $4 \geq 3$
- $S = \{Quiggely, Ruiz, setia\} \rightarrow N\{Quiggely, Ruiz, Setia\}$ $4 \geq 3$

S = { Ping, Quiggsely, Ruiz, Sitea } → 4! ≥ { Ping, Quiggsely, Ruiz, Sitea }

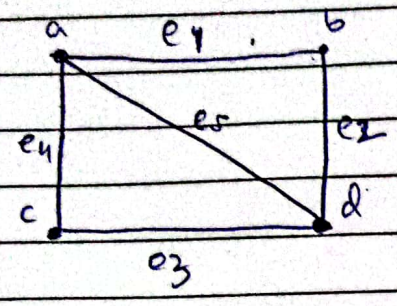
(c) Yes, an assignment exists where each employee supports one area. 4! >= 4.

Ping → Hardware
~~Quiggsely → Networking~~
Ruiz → Wireless
Sitea → Software

Date:

Question: 08

1



Adjancey List

Vertex	Adjacent vertices.
a	b, c, d
b	a, d
c	a, d
d	c, a, b.

Adjancey Matrix.

$$\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

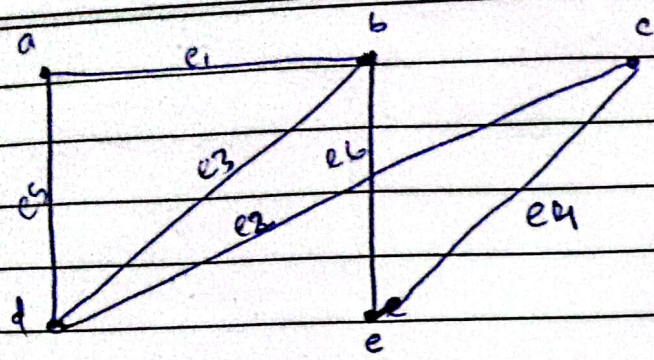
OR

Indices matrices

	e1	e2	e3	e4	e5
a	1	0	0	1	1
b	1	1	0	0	0
c	0	0	1	1	0
d	0	1	1	0	1

Date: _____

2.



Adjancey list

a	b, d
b	a, d, e
c	d, e
d	a, b, c, ~~e~~
e	b, c

Adjancey Matrix

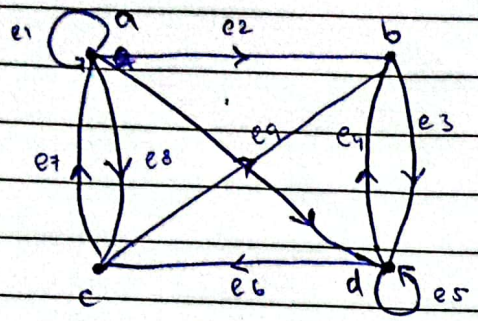
$$\begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 \end{bmatrix}$$

Indice matrix

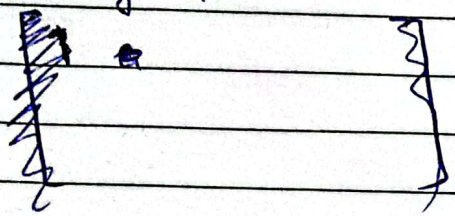
$$\begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Date: _____

3..



Adjancey List.



Vertices	Adjacent vertices.
a	a, b, c, d
b	d
c	a, b
d	d, c, b

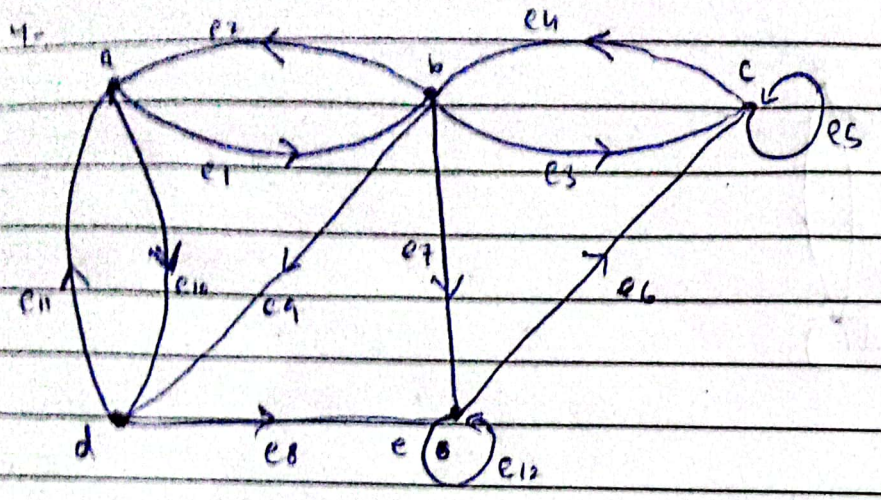
Adjancey Matrices.

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

Indices matrices

$$\begin{array}{c} a \\ b \\ c \\ d \end{array} \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & -1 & 1 & 0 \\ 0 & -1 & 0 & 1 & -1 & 0 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 & -1 & 1 \\ -1 & 0 & -1 & 1 & 1 & 1 & 0 & 0 & -1 \end{bmatrix}$$

Date: _____



Adjancey List

Vertices	Adjacent Vertices
a	b, d,
b	a, c, d, e.
c	b, c,
d	a, e
e	c, e

Adjancy Matrix

	a	b	c	d	e
a	0	1	0	1	0
b	1	0	1	1	1
c	0	1	1	0	0
d	1	0	0	0	1
e					

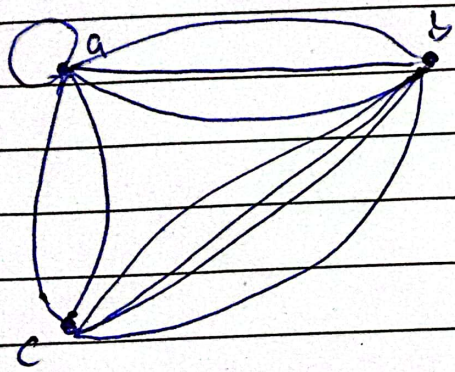
Indices Matrix

	e1	e2	e3	e4	e5	e6	e7	e8	e9	e10	e11	e12
a	-1	1	0	0	0	0	0	0	0	1	-1	0
b	-1	1	1	-1	0	0	1	0	1	0	0	0
c	0	0	-1	1	1	-1	0	0	0	0	0	0
d	0	0	0	0	0	0	0	1	-1	-1	1	0
e	0	0	0	0	0	1	-1	0	0	0	0	1

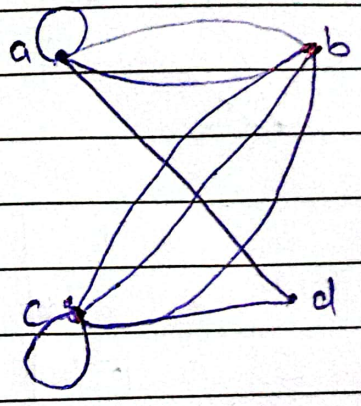
~~Indices Matrix~~

Question : 04

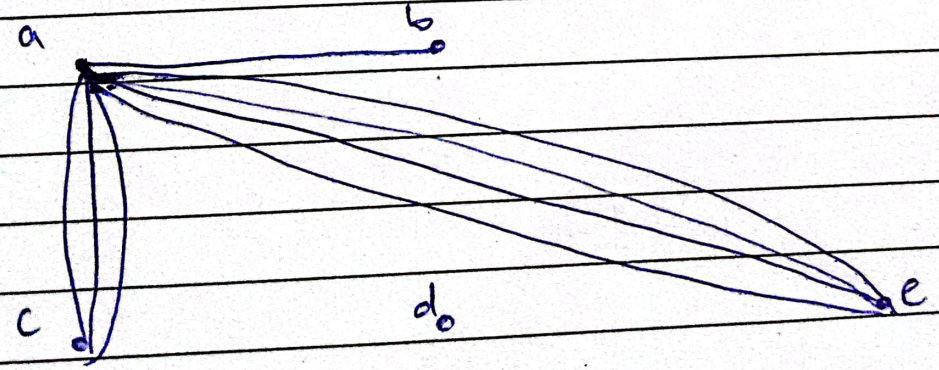
16.



17



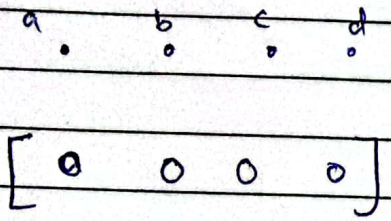
18



Date: _____

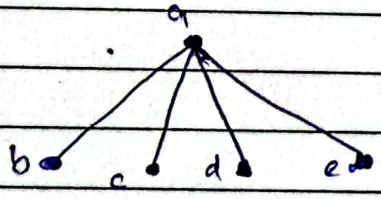
Question: 10

(a) K_4



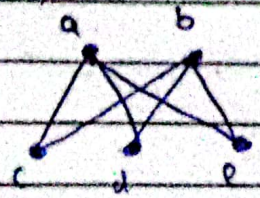
$$\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

(b) $K_{1,4}$



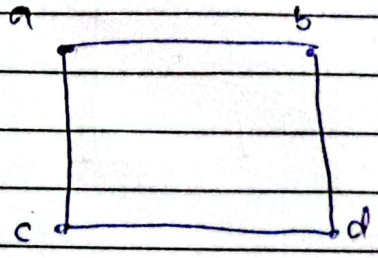
$$\begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(c) $K_{2,3}$



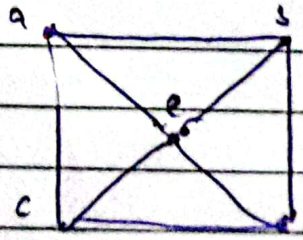
$$\begin{bmatrix} 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \end{bmatrix}$$

(d) C_4



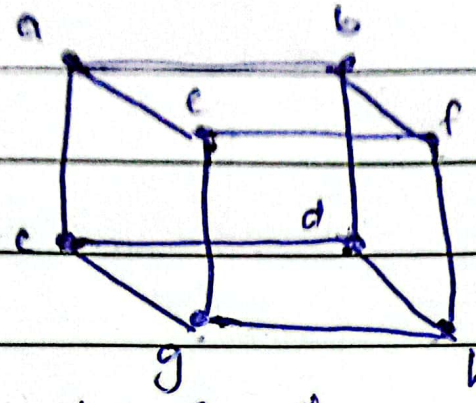
$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

(e) W_4



$$\begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

(f) Q3



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

Date:

Question 11

19
$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

20
$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

21
$$\begin{bmatrix} 1 & 1 & 2 & 1 \\ 1 & 0 & 0 & 2 \\ 1 & 0 & 1 & 1 \\ 0 & 2 & 1 & 0 \end{bmatrix}$$

Date: _____

Question : 12

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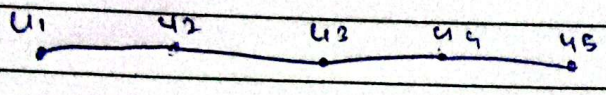
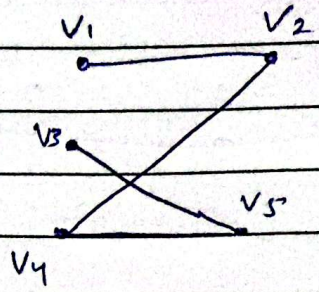




No of vertices ⇒ 5 = 5

No of edges ⇒ 4 = 4

Sequence of dgrees 1, 2, 2, 2, 1 = 1, 2, 1, 2, 2

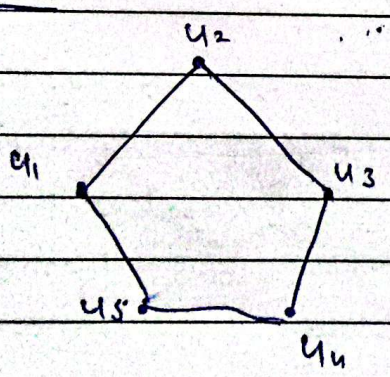
f(u1) = V1 , f(u2) = V2 , ~~f(u3) = V4~~

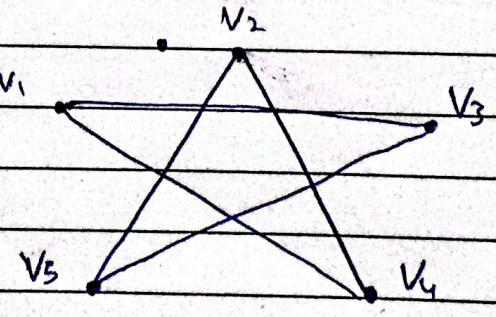
~~Not~~ Isomorphic f(u3) = V4 , f(u4) = V5, f(u5) = V3

~~because sequence of degrees dont match~~

f(u1) = V1
f(u2) = V2
f(u3) = V4
f(u4) = V5
f(u5) = V3

39





No of vertices ⇒ 5 = 5

No of edges ⇒ 5 = 5

~~No~~ Sequence of dgrs ⇒ 2, 2, 2, 2, 2 = 2, 2, 2, 2, 2

f(u1) = V1

f(u2) = V3

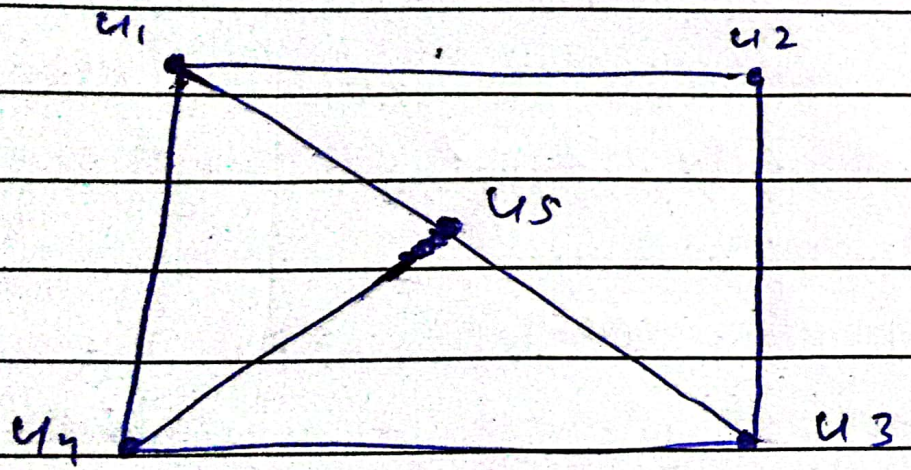
f(u3) = V5

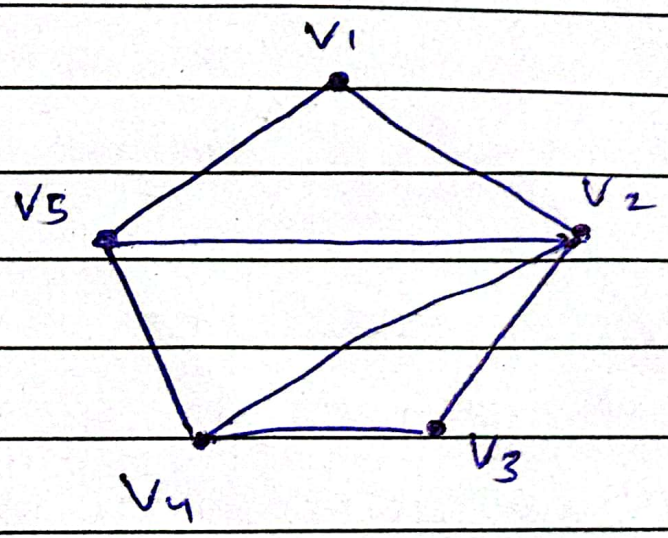
f(u4) = V2

f(u5) = V4

Date:

40





No of Vertices => 5 = 5

No of edges => 5 = 5

No of sequence of degrees => 3, 2, 3, 3, 3 = 2, 4, 2, 3, 3

Non Isomorphic sequence of degrees donot match.

Date: _____

41

No of vertices ⇒ 7 = 7

No of edges ⇒ 7 = 7

sequence of degrees ⇒ 2, 2, 2, 2, 2, 2, 2 = 2, 2, 2, 2, 2, 2, 2

$f(u_1) = v_1$, $f(u_2) = v_5$, $f(u_3) = v$

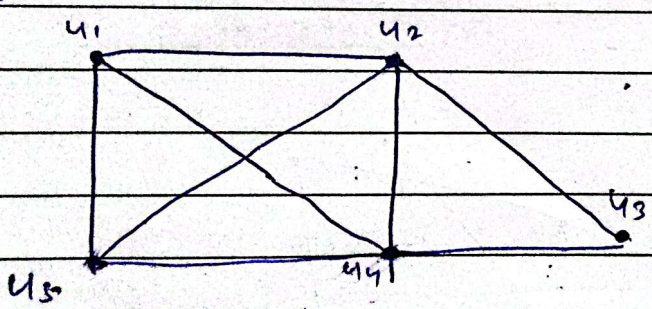
$f(u_4) = v_2$, $f(u_5) = v_4$

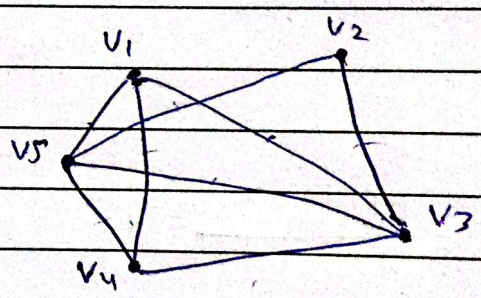
Isomorphic !

Note that the left graph makes the complete circuit $(u_1, u_2, u_3, u_4, u_5, u_6, u_7, u_1)$ of length 7 but the right graph does not have circuit of length 7 due to its 2 components.

Hence, Its Non-Isomorphic

42





43

No of Vertices ⇒ 5 = 5

No of edges ⇒ 8 = 8

Sequence of degrees ⇒ 3, 4, 2, 4, 3 = 3, 2, 4, 3, 4.

Isomorphic

$f(u_1) = v_1$

$f(u_2) = v_3$

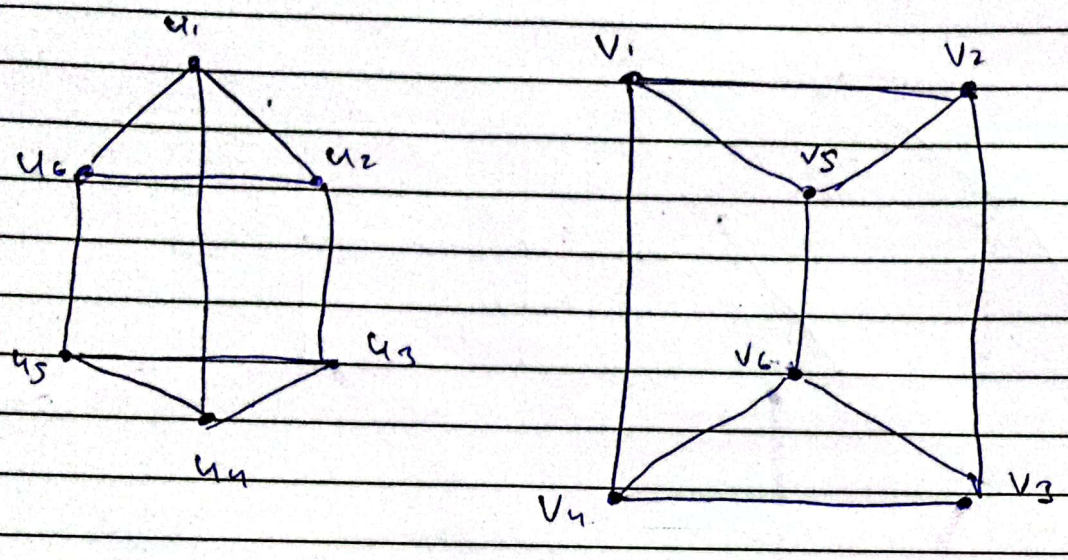
$f(u_3) = v_2$

$f(u_4) = v_5$

$f(u_5) = v_3$

Date: _____

Q3



No of vertices => 6

No of edges => 6

Sequence of degrees => 3, 3, 3, 3, 3, 3 = 3, 3, 3, 3, 2,

Both has circuit of length 6

Isomorphic.

f(u1) = V4

f(u2) = V2

f(u3) = V3

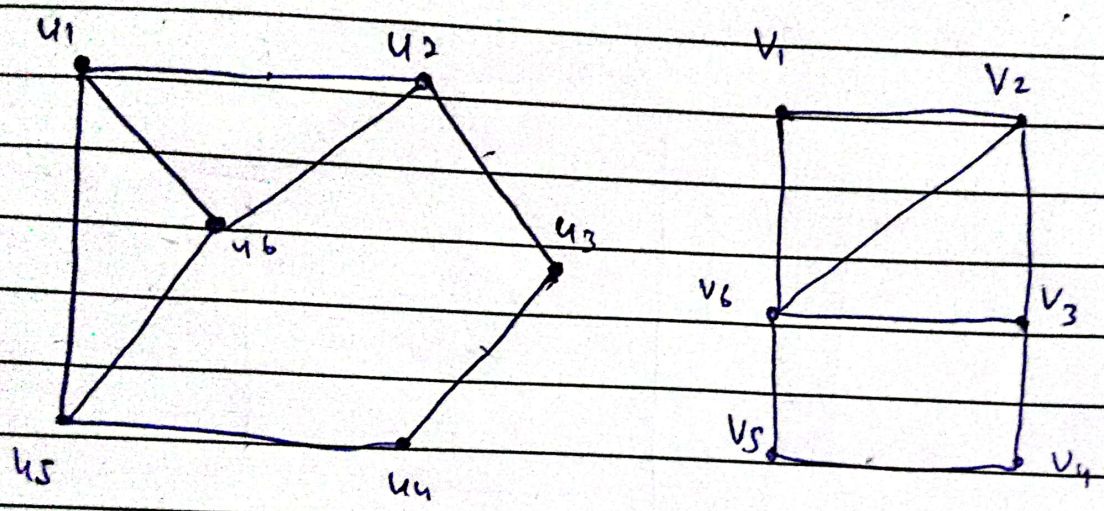
f(u4) =

sequence of degrees donot match!

Hence Nonisomorphic.

Date: _____

44.



No of Vertices => 5 = 5

No of edges => 8 = 8

Sequence of degrees => 3, 3, 2, 2, 3, 3 = 2, 3, 2, 2, 2, 4

Sequence of degrees donot match.

$f(u_3) = v_2$

45

No of vertices => 8=8

No of edges => 8=8

Sequence of degrees => 1, 2, 3, 1, 2, 3, 1, 1 = 1, 3, 1, 2, 2, 3, 1, 1

$f(u_1) = v_1$

$f(u_2) =$

Non-Isomorphic

Because Mapping is not possible.

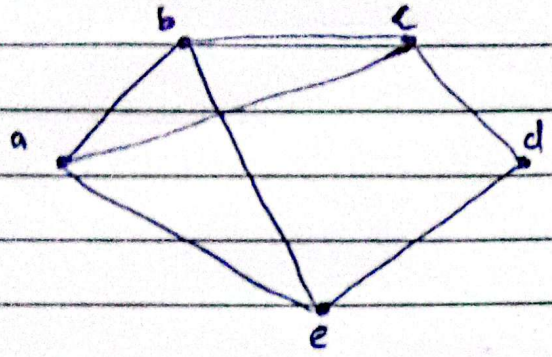
a, b, e, c, d, b a, e, d

a, c, e, b, e, c, d, b a, e, d

Date: _____

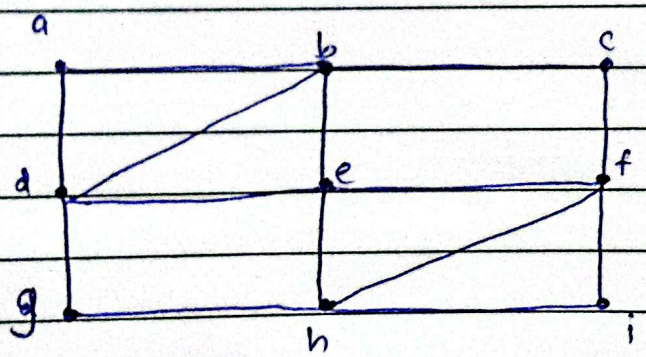
Question: 13

1.



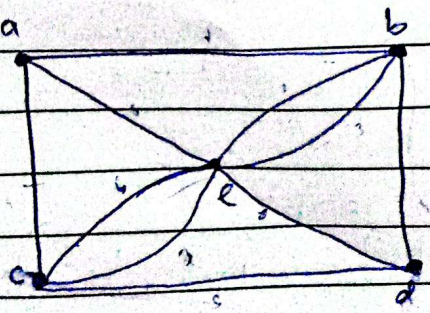
• Euler path doesnot exist. because 4 vertices ~~contains~~ have odd & degrees.

2.



~~Euler path doesnot exist because 4 vertices have odd degrees~~. Euler circuit exists because all degree are even. a bd efhigfcbehgda.

3.



~~a, b, e, b, d, c, e, c, a,~~

a, b, d, c, e, b, e, c, a,

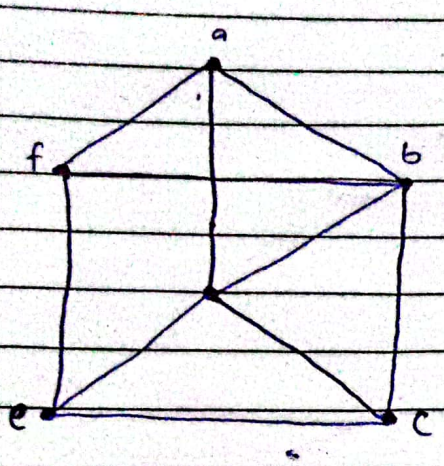
Euler path exist because 2 vertices have odd deg

MIGHTY PAPER PRODUCT

Euler circuit doesnot exist.

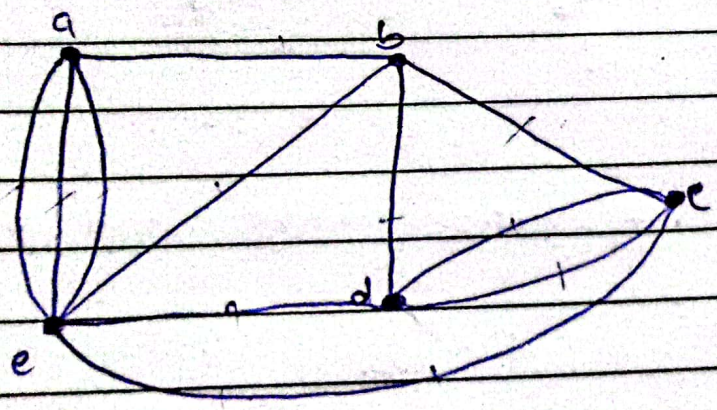
Date:

4.



Euler path doesnot exist because 4 vertices have odd degrees.

5.

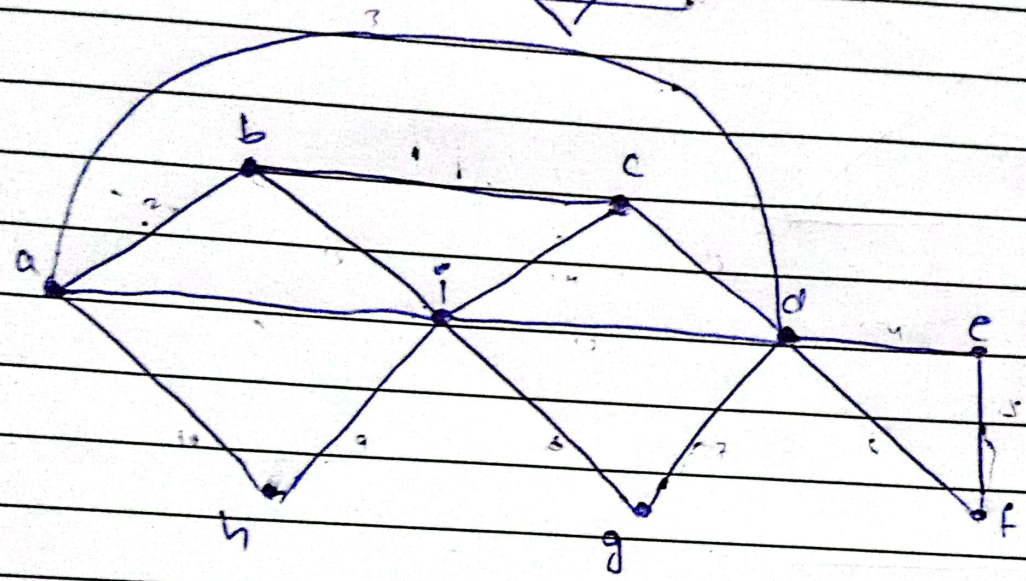


Euler path exist because no vertices has odd degr

~~aeaecdcdbedba~~ aeaecdcdbedba

Hence, Euler circuit also exist

B-



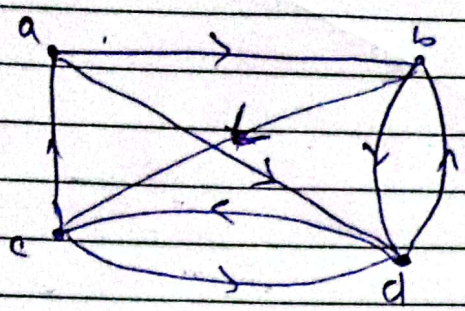
Euler path exist because 2 vertices have odd degrees.

c b a d e f d g i h a i d c i b.

Date: _____

Question 13

18.



$deg^-(a) = 2$ $deg^-(b) = 2$ $deg^-(c) = 2$ $deg^-(d) = 2$

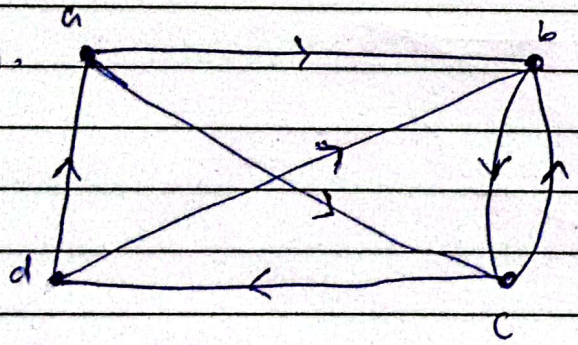
$deg^+(a) = 1$ $deg^+(b) = 2$ $deg^+(c) = 2$ $deg^+(d) = 3$

Euler path exist

abdbcadcd

Euler circuit doesnot exist because a and d vertices has not indegree and out degrees equal.

19.



$deg^-(a) = 2$ $deg^-(b) = 1$ $deg^-(c) = 2$ $deg^-(d) = 2$

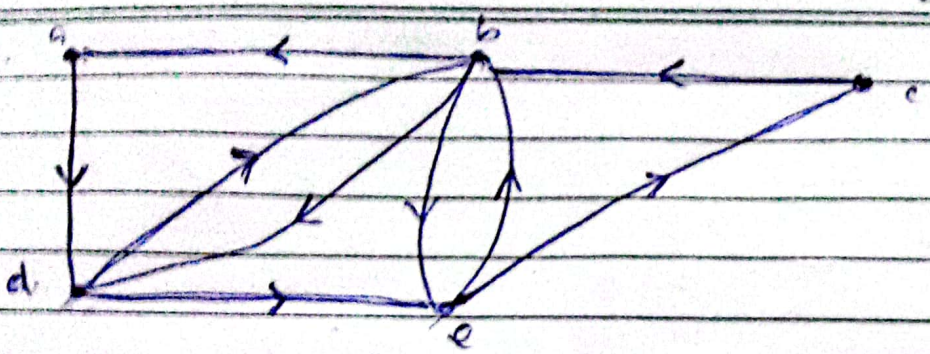
$deg^+(a) = 1$ $deg^+(b) = 3$ $deg^+(c) = 2$ $deg^+(d) = 1$

Euler path doesnot exist because ~~odd no of~~ no of vertices with not equal to the in and out degrees are odd.

a d e d b a e b e b e c e

Date:

20.



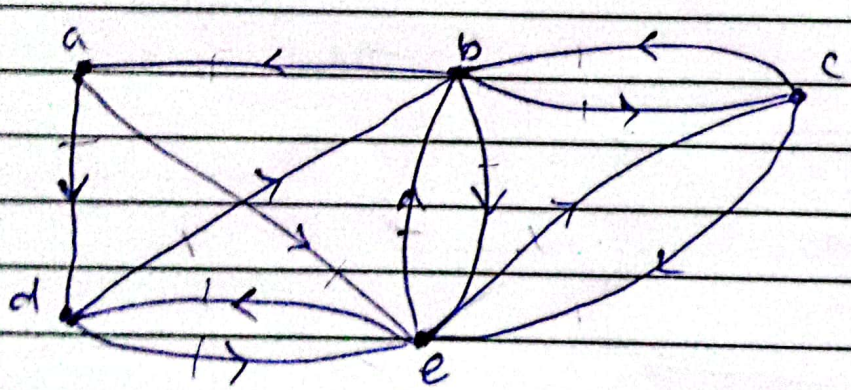
deg⁻(a) = 1 deg⁻(b) = 3 deg⁻(c) = 1 deg⁻(d) = 2 deg⁻(e) = 2
deg⁺(a) = 1 deg⁺(b) = 3 deg⁺(c) = 1 deg⁺(d) = 2 deg⁺(e) = 2

Euler path exist

Euler circuit exist.

a d b d e b e c b a

21.



deg⁻(a) = 2 deg⁻(b) = 3 deg⁻(c) = 2 deg⁻(d) = 2 deg⁻(e) =
deg⁺(a) = 1 deg⁺(b) = 3 deg⁺(c) = 2 deg⁺(d) = 2 deg⁺(e) =

Euler path exist.

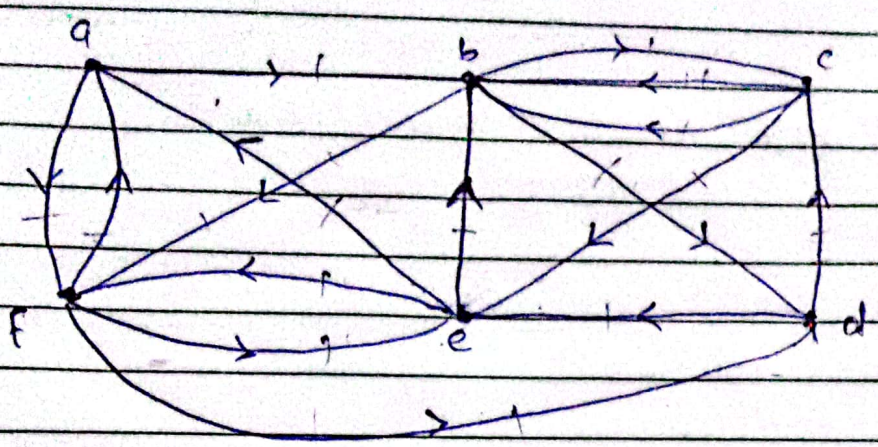
a d e d b a e b e b e c e

Euler circuit doesnot exist.

b c
c b

Date:

22.



$\deg^-(a) = 2$ $\deg^-(b) = 2$ $\deg^-(c) = 3$ $\deg^-(d) = 2$ $\deg^-(e) = 3$

$\deg^+(a) = 2$ $\deg^+(b) = 4$ $\deg^+(c) = 2$ $\deg^+(d) = 2$ $\deg^+(e) = 3$

$\deg^-(f) = 3$

$\deg^+(f) = 3$

Euler path exist.

Euler path: c, e, b, d, e, a, f, a, b, f, e, f, d, c, b, c, b

Euler circuit doesnot exist.

Question 16

30. Hamilton path exist : a b c f e d
Hamilton circuit doesnot exist

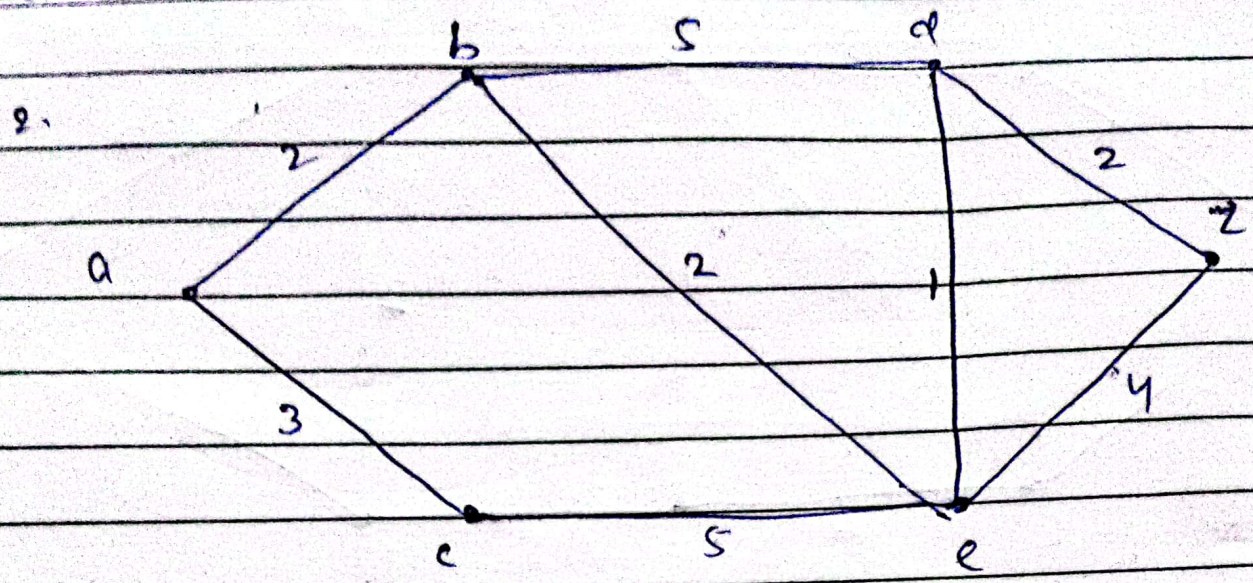
31. Hamilton path exist: a b c d e
Hamilton circuit exist: a b c d e a

32. Hamilto path exist : c b a d e f
Hamilton circuit does not exist

33. Hamilton ~~circuit~~ path doesnot exist
Hamilton circuit doesnot exist

Date:

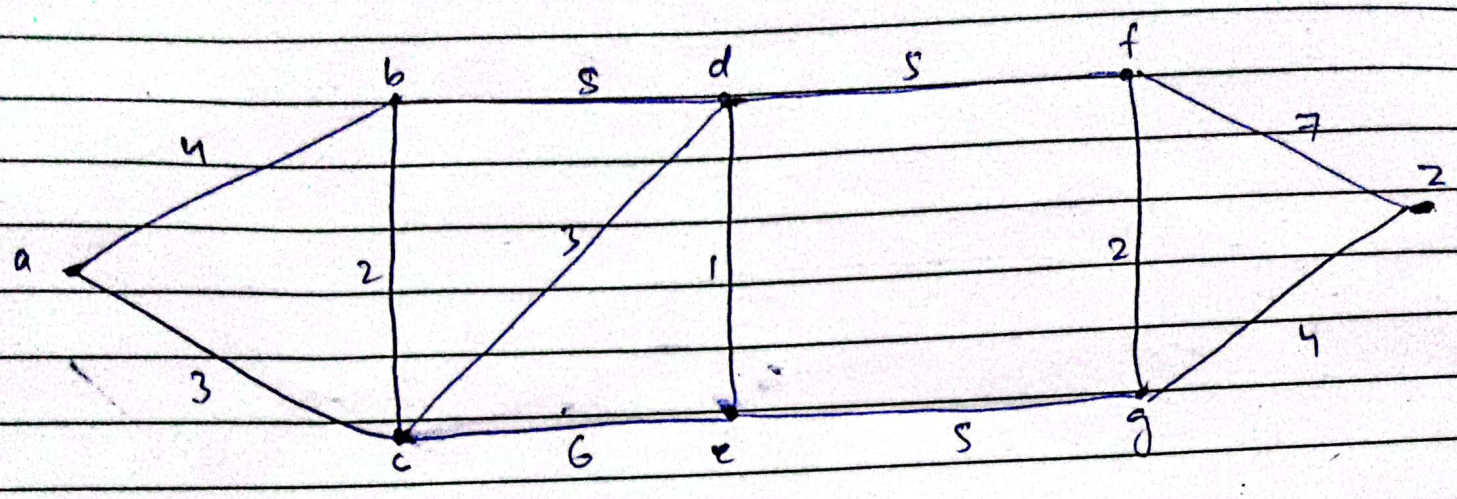
Question 12



Step	N'	D(b)	D(d)	D(c)	D(e)	D(z)
0	a	2,a	∞	3,a	∞	∞
1	ab		5,b	3,a	2,b	∞
2	abe		4,e	3,a		4,e
3	abed			3,a		2,d
4	abedz					
5						

Path abedz 7 Miles.

Date: _____



Steps	N'	D(b)	D(c)	D(d)	D(e)	D(f)	D(g)	D(z)
0	a	4,a	3,a	∞	∞	∞	∞	∞
1	ac	4,a		6,c	9,c	∞	∞	∞
	acb			6,c	9,c	∞	∞	∞
	acbd				7,d	11,d	∞	8,e
	acbde					11,e	∞	7,e
	acbdef						12,e	18,f
	acbdefg							16,g

16 miles