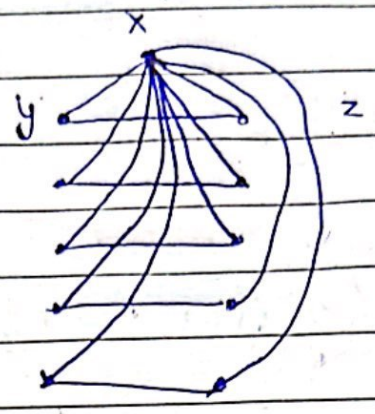
K21-3262 Sec: K Graph Theory

Date: Wednesday 19 09 23

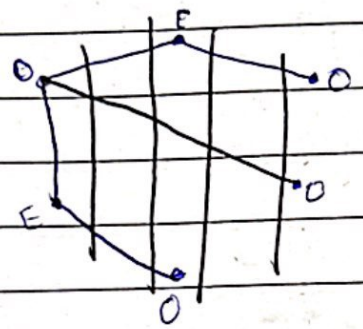
Assignment - 01

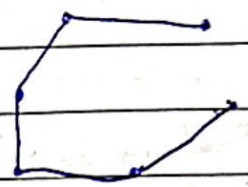
Question 1

a) $F_5 = 2(5)+1$
$= 11$

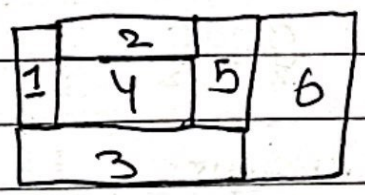


b)





c)



d)

$$\begin{bmatrix} 0 & 0 & 0 & \cdots & 0 \\ 0 & 0 & 0 & \cdots & 0 \\ - & - & - & - & - \\ - & - & - & - & - \\ 0 & 0 & 0 & \cdots & 0 \end{bmatrix}$$

$$\begin{array}{c|ccc} & v_1 & v_2 & v_3 \\ \hline v_1 & 0 & 1 & 1 \\ v_2 & 1 & 0 & 1 \\ v_3 & 1 & 1 & 0 \end{array}$$

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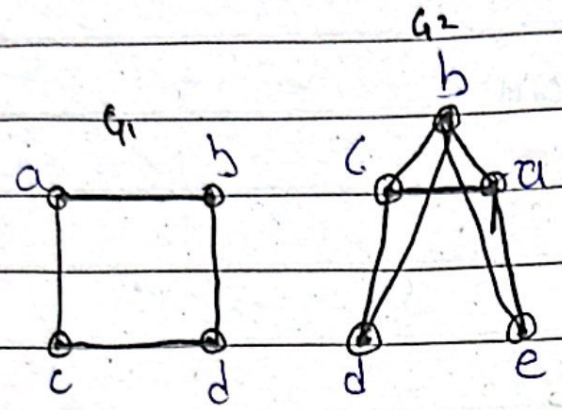
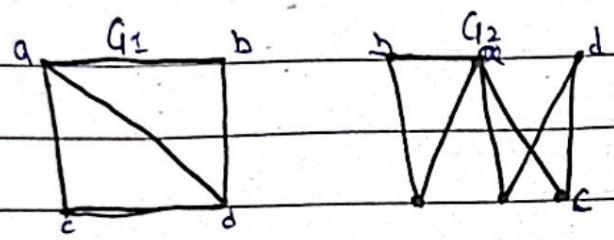
Q2 a)



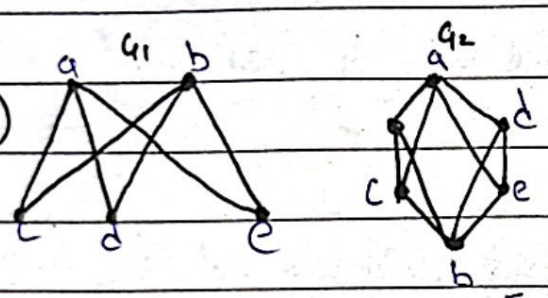
it is a subgraph of right graph (G_1 is subgraph of G_2)

b)



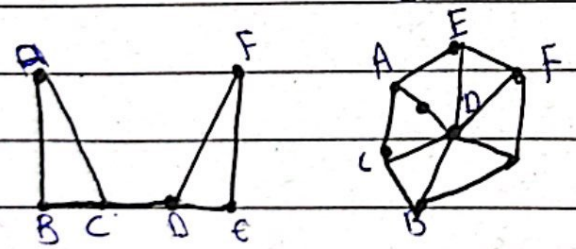
No it is not a subgraph because there is only one vert in G_2 graph with 4 edges

c)



it is a subgraph- ~~be~~

d)



It is not subgraph

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b) i) ~~or~~ Using Handshaking theorm

① $\Sigma d(v) = 2E$

$3 \times 12 = 36$

$36 = 2(28) \approx 36 \neq 56$

② $4 \times 12 = 2(28)$

$48 \neq 56$

③ if 11 vertices have degree of 3 and remaing 4 then

$(11 \times 3)(4 \times 1) = 37$

$37 \neq 56$

So NO there is NO way to construct graph with 28 edges & 12 vertices with degree 3 or 4

ii) Using Hand Shaking theorm

$x + y = 28$

$3x + 6y = 2 \cdot 28$

$3x + 6y = 56$

$3(6) + 6(6) = 56$

$54 \neq 56$

NO so there exist NO graph with ~~12~~ vertice having 28 edge with 3 or 6 degree

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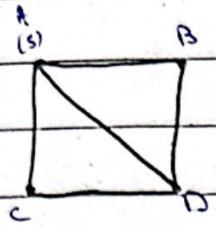
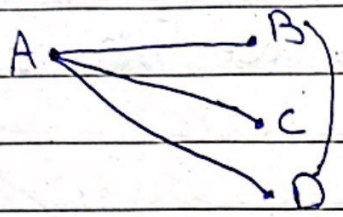
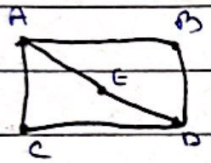
c) a)

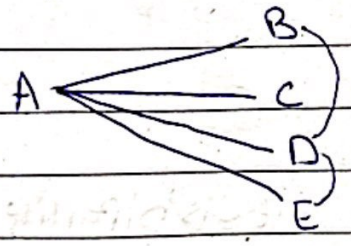




NO it is not a bipartite because vertice B and D ard adiecent

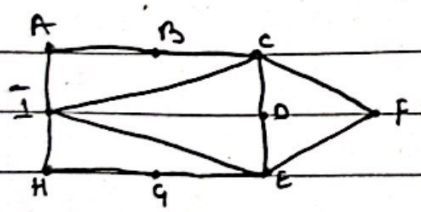
b)

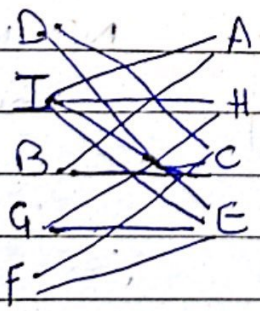




it is not bipartite because vertice B and D are adjacent ~~also complete gr~~

c)





It is a bipartite graph

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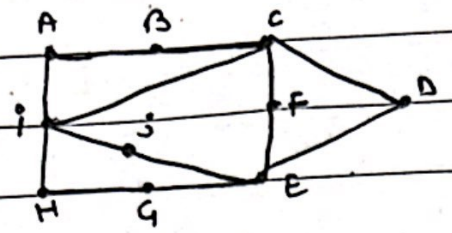
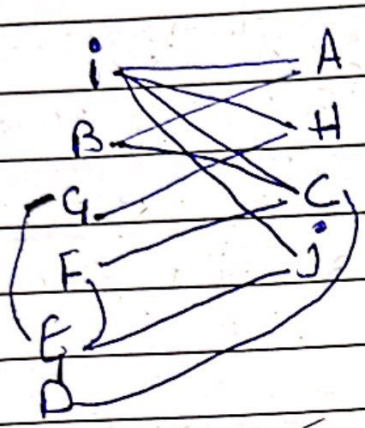
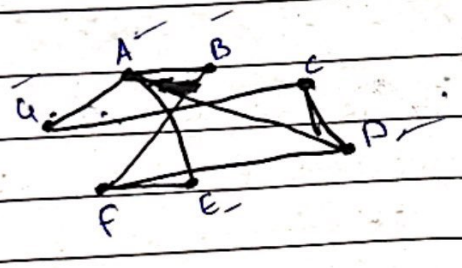
d)

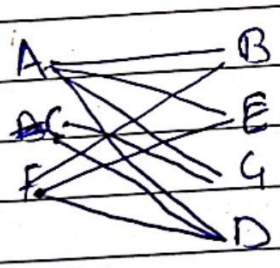




it is not bipartite

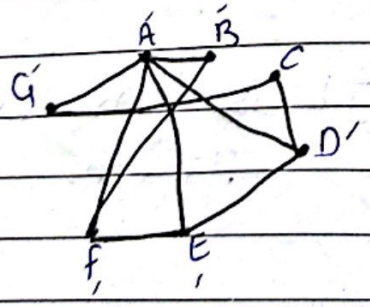
e)

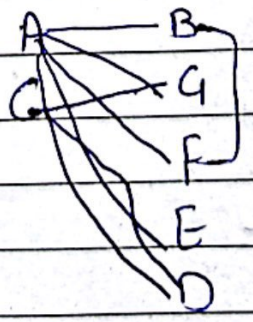




It is bipartite

f)





NO - it is not Bipartite

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Q 3a)

a i) left graph Right graph

3, 3, 3, 2, 2, 1, 1 4, 3, 3, 2, 1, 1, 1

ii) Not a isomorphism because in Right graph there exist a 4 degree vertice which is not in left graph and degree sequence is not same

left graph Right graph

b i) 3, 3, 2, 2, 2, 1, 1 3, 3, 2, 2, 2, 1, 1

graph are isomorphic

ii) A -> P , B -> q, E -> t, C -> U, D -> V, F -> r, G -> S

left graph Right graph

(i) 3, 2, 2, 2, 1, 1 3, 2, 2, 2, 1, 1

graph are isomorphic

ii) A -> p

B -> r

C -> q

D -> s

E -> t

~~P~~ F -> U

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(b) Degree Sequence of left graph

3, 3, 3, 3, 3, 3, 3, 3

complement

= 4, 4, 4, 4, 4, 4, 4, 4

Now compare it with degree sequence of right graph

Right = 4, 4, 4, 4, 4, 4, 4, 4 left = 4, 4, 4, 4, 4, 4, 4

Both are isomorphic

Q4 i) G1: 4, 4, 4, 4, 4, 4, 4

(ii) Triangle : A-G-F, C-D-E, A-G-B, C-D-B, B-A-C

F-E-D - 6 triangles

G2 i) 5, 4, 4, 4, 4, 4, 3

ii) A-D-C, A-B-C, A-G-D, B-F-C, B-A-D, B-C-D, E-F-G

E-D-F, E-F-G (9)

G3 i) 5, 4, 4, 4, 4, 4, 3

ii) 1-2-6, 1-6-7, 3-7-4

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b) let $x+y=20$

$3x+7y=2(62)$ ∴ where x vertex with 3 degree and y vertex of 7 degree

$3x+7y=124$

Solving Both equation simultaneously

$x+y=20$

$3x+7y=124$

$x=4 \quad y=16$

$3(4)+7(16)=124$

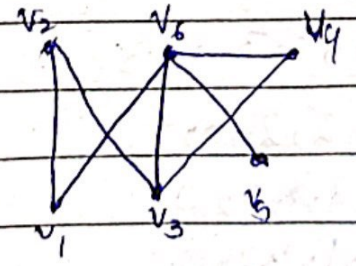
$124=124$

So 16 vertices have degree 7

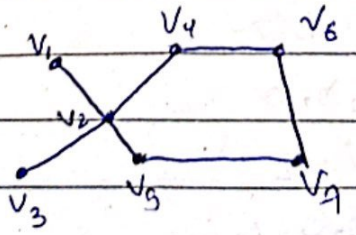
Q 5 a) vertices = 6

edge = 7

beta $= \frac{7}{6}$



ii) $\frac{7}{7}$



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b)(i) 6, 5, 4, 4, 3, 2

0, 4, 3, 3, 2, 1

4, 3, 3, 2, 1, 0 it is not graphical.

0, 2, 2, 1, 0, 0

2, 2, 1, 0, 0, 0

0, 1, 0, 0, 0, 0

1, 0, 0, 0, 0, 0

0, -1, -1, -1, -1, -1

ii) 6, 6, 4, 2, 2, 2, 1, 1 It is not graphical

0, 5, 3, 1, 1, 1, 1, 0

5, 3, 1, 1, 1, 0, 0, 0

0, 2, 0, 0, 0, -1, 0, 0

iii) 3, 3, 3, 3, 3, 3

0, 2, 2, 2, 3, 3

3, 3, 2, 2, 2, 0

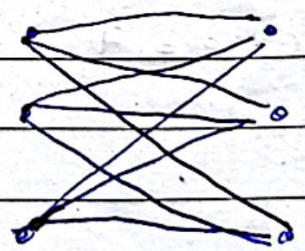
0, 2, 1, 1, 2, 0

2, 2, 1, 1, 0, 0

0, 1, 1, 0, 0, 0

1, 1, 0, 0, 0, 0

0, 0, 0, 0, 0, 0



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Q5C) Clique Size = 4

max independent Size = 03

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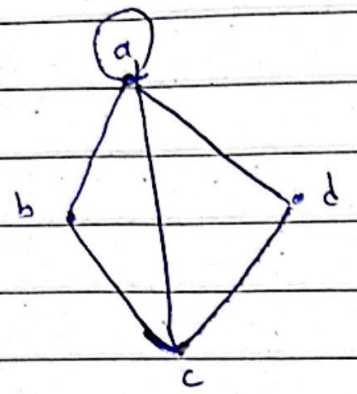
d)

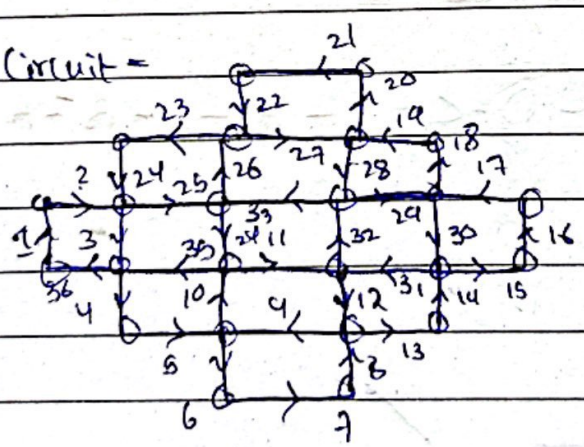


Q6) a) Every vertice have even degree of 4 so it is eulerian

Eulerian Circuit = A-B-C-D-E-F-G-E-A-C-F-B-D-G-A

b) Every vertice have even degree ~~has~~ of 2 & 4. So it is eulerian

Eulerian Circuit =



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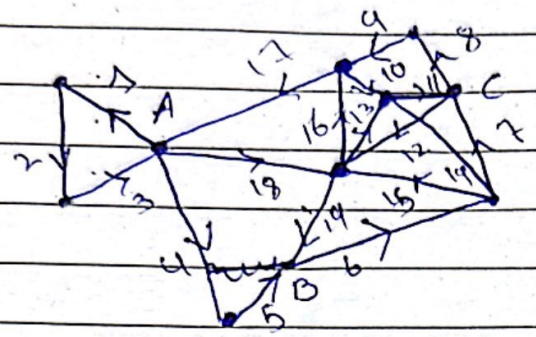
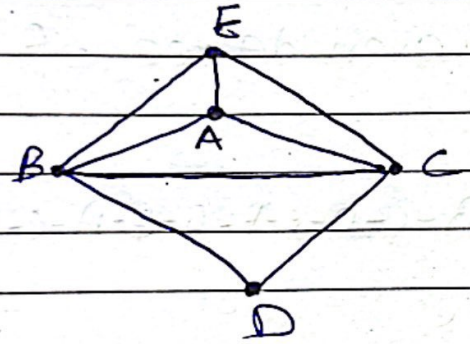
b)



Q7)



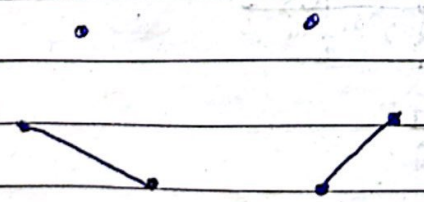
(i) Yes cycle: E - B - D - C - A - E

(ii) Yes Path: B - E - A - C - D

(iii) NO

iv) Yes trail: E - B - D - C - E - A - C - B - A

Q8) i) G - S



ii) $|S| = 3$

$c(G-S) = 4$

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iii) $|S| = 3 < 4 = C(G-S)$ Yes

iv) $C(G-S) > |S|$

(necessary condition not satisfied)

these graph is not Hamiltonian

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