UNIVERSITI TEKNOLOGI MALAYSIA

Semester 2020/2021

Subject : Discrete Structure SECI1013

Section : 07

Task : Assignment 4

Submission : 23/01/2021

Group Number:14

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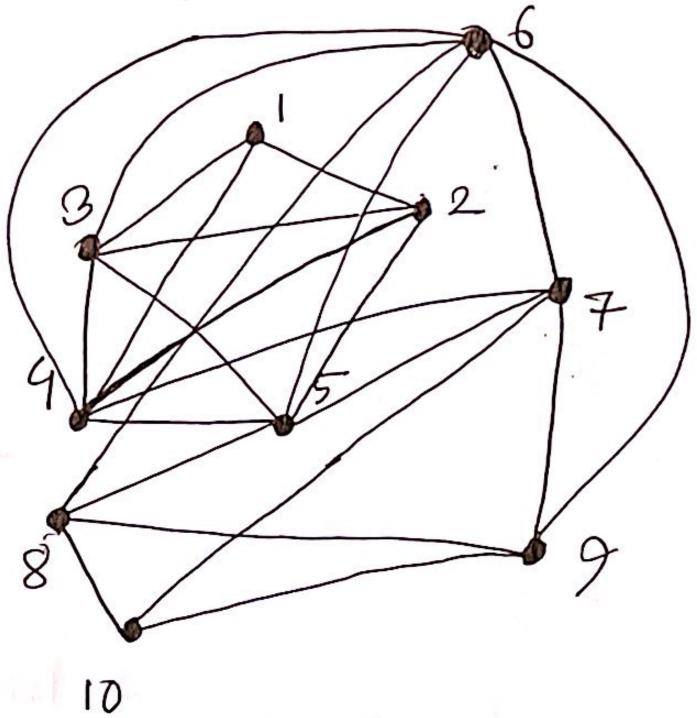
1. Q.



Number of edges = 24

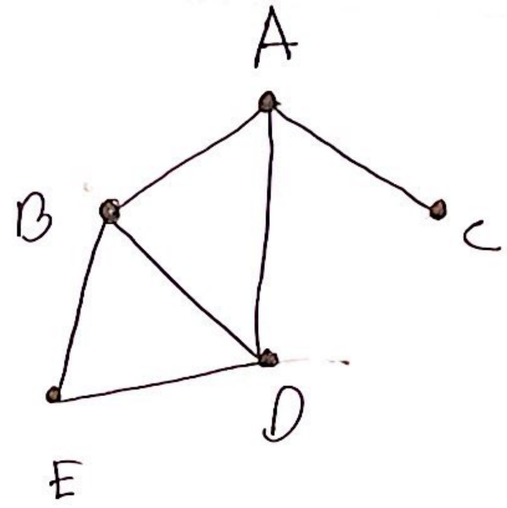
List of edges : (1,2), (1,3), (1,4), (2,3), (2,4), (2,5),
(3,4) (3,5), (3,6), (4,5), (4,6), (4,7), (5,6), (5,7),
(5,8), (6,7), (6,8), (6,9) (7,8) (7,9) (7,10) (8,9),
(8,10) (9,10).

2.

(a)

given,

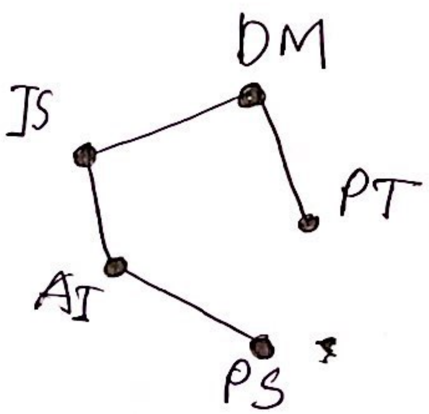
A= Ahmad
B= Bakri
C= Chong
D= David
E= Ehsan.



Adj Matrix

	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

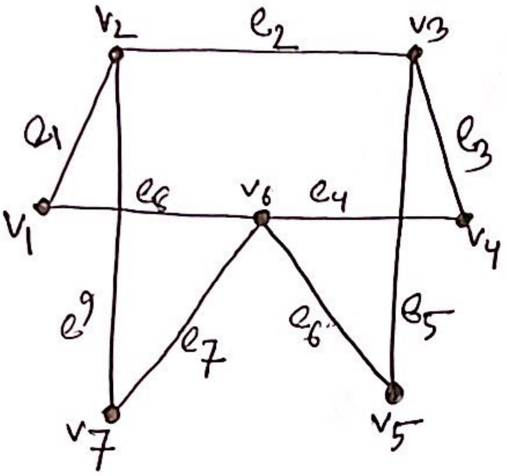
(b)

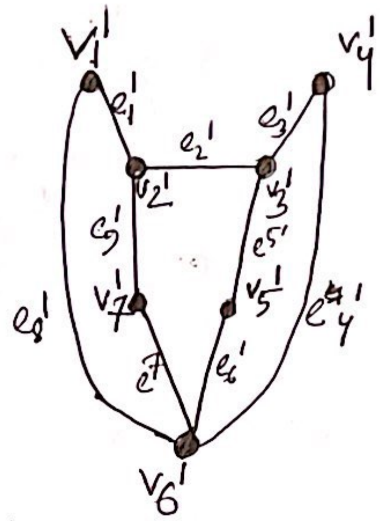


Adj Matrix

	DM	PT	AI	PS	IS
DM	0	1	0	0	1
PT	1	0	0	0	0
AI	0	0	0	1	1
PS	0	0	1	0	0
IS	1	0	1	0	0

3.





here,

$v_1 \to v_1'$

$v_2 \to v_2'$

$v_3 \to v_3'$

$v_4 \to v_4'$

$v_5 \to v_5'$

$v_6 \to v_6'$

$v_7 - v_7'$

again,

$deg(v_1) = deg(v_1') = 2$

$deg(v_2) = deg(v_2') = 3$

$deg(v_3) = deg(v_3') = 3$

$deg(v_4) = deg(v_4') = 2$

$deg(v_5) = deg(v_5') = 2$

$deg(v_6) = deg(v_6') = 4$

$deg(v_7) = deg(v_7') = 2$

and,

$e_1 \to e_1'$

$e_2 \to e_2'$

$e_3 \to e_3'$

$e_4 \to e_4'$

$e_5 \to e_5'$

$e_6 \to e_6'$

$e_7 \to e_7'$

So, two drawing represent the same graph.

(showed).

Question 4

For graph G.

$$A_G = \begin{array}{c|cccc} & v_1 & v_2 & v_3 & v_4 \\ \hline v_1 & 1 & 0 & 1 & 0 \\ v_2 & 0 & 0 & 1 & 0 \\ v_3 & 1 & 0 & 0 & 1 \\ v_4 & 0 & 0 & 1 & 0 \end{array}$$

$$I_G = \begin{array}{c|cccccc} & e_1 & e_2 & e_3 & e_4 & e_5 & e_6 \\ \hline v_1 & 2 & -1 & 1 & 0 & 0 & 0 \\ v_2 & 0 & 0 & 0 & 1 & 0 & 0 \\ v_3 & 0 & 1 & -1 & -1 & -1 & 1 \\ v_4 & 0 & 0 & 0 & 0 & 1 & -1 \end{array}$$

For graph H.

$$A_H = \begin{array}{c|cccc} & v_1 & v_2 & v_3 & v_4 \\ \hline v_1 & 1 & 0 & 0 & 0 \\ v_2 & 0 & 1 & 1 & 1 \\ v_3 & 0 & 1 & 1 & 0 \\ v_4 & 0 & 1 & 0 & 0 \end{array}$$

$$I_H = \begin{array}{c|cccccc} & e_1 & e_2 & e_3 & e_4 & e_5 & e_6 \\ \hline v_1 & 2 & 0 & 0 & 0 & 0 & 0 \\ v_2 & 0 & 2 & 1 & 1 & 1 & 0 \\ v_3 & 0 & 0 & 0 & 0 & 1 & 2 \\ v_4 & 0 & 0 & 1 & 1 & 0 & 0 \end{array}$$

Question 5

a) Numbere of vertices: Both are 5.

Numbe of edges: Both are 5.

Degrees of corresponding vertices: Both has 2 vertices with degree 3, 2 vertices with degree 2, 1 vertices with degree 1

$$G_1 = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{array} \begin{array}{c} \begin{array}{ccccc} v_1 & v_2 & v_3 & v_4 & v_5 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

$$G_2 = \begin{array}{c} \\ u_5 \\ u_4 \\ u_2 \\ u_3 \\ u_1 \end{array} \begin{array}{c} \begin{array}{ccccc} u_5 & u_4 & u_2 & u_3 & u_1 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

G_1 and G_2 are same, so they are isomorphic

Question 5

b) Number of verticeo: Both 5

Number of edges : Both 6

Degree of corresponding : H_1 = 1 vertices with degree 4, 1 vertices with degree 3, 1 vertices with degree 2, 2 vertices with degree 1

H_2 = 2 vertices with degree 3, 2 vertices with degree 3, 2 vertices with degree 2, 1 vertices with degree 1

H_1 and H_2 are not same. They are not isomorphic

Assignment 4

Question 6

a) $v_0 e_1 v_1 e_{10} v_5 e_9 v_2 e_2 v_1$

∴ no repeated ~~eg~~ edges

∴ Repeated vertices

∴ It is trails

b) $v_4 e_7 v_2 e_9 v_5 e_{10} v_1 e_3 v_2 e_9 v_5$.

∴ It is just walk.

c) v_2

closed walk.

d) $v_5 e_9 v_2 e_4 v_3 e_5 v_4 e_6 v_4 e_8 v_5$

It starts and ends at same vertex but no repeated edge

∴ It is a circuit.

e) $v_2 e_4 v_3 e_5 v_4 e_8 v_5 e_9 v_2 e_7 v_4 e_5 v_3 e_4 v_2$.

Intial and ~~terminal~~ terminal vertices are same.

~~as~~ ∴ ~~It~~ It is closed walk.

f) $v_3 e_5 v_4 e_8 v_5 e_{10} v_1 e_3 v_2$

no repeated edge and vertices

∴ It is path.

Queration 7.

a) there are 3 paths
$v_1 e_1 v_2 e_2 v_3 e_5 v_4$, $v_1 e_1 v_2 e_3 v_3 e_5 v_4$, $v_1 e_1 v_2 e_4 v_3 e_5 v_4$

b) there are 9 trials

c) there are ~~[illegible]~~ ∞, infinite walks

Queration 8

Graph a

vertex	v_1	v_2	v_3	v_4	v_5
~~edge~~ degree	2	4	2	4	5

Here all vertices have ~~a~~ ~~eve~~ even degree

$\therefore$ It is an Euler circuit.

Graph b

vertex	v_0	v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_9
~~edge~~ degree	2	5	2	2	2	4	2	3	3	3

Here more than ~~two~~ vertices have odd degree

$\therefore$ It is not an Euler circuit.

Question 9

Graph a

vertex	u	v_0	v_1	v_2	v_3	v_4	v_5	v_6	v_7	w
~~edges~~ degree	3	2	2	4	2	4	2	4	2	3

Start and end vertices have ~~ev~~ odd degree so it is an euler path

~~euler path: u, v_1, v_0, v_7, u,~~

euler path: $u, v_1, v_0, v_7, u, v_2, v_3, v_4, v_2, v_6, v_4, w, v_6, v_5, w$

~~Graph b~~

~~vertex~~	~~u~~	~~a~~	~~c~~	~~b~~	~~f~~	~~d~~	~~e~~
~~degree~~							

Graph b

vertex	u	a	b	c	d	e	f	g	h	w
degree	3	2	2	2	2	3	4	2	3	3

Here more than two vertices have odd degree therefore it is not an euler path.

Question 10

Graph a

Here verticeso (u, v_2, v_4, v_6, w) are ~~va~~ tranversed more than once. Therefore, there is no Hamilton circuit.

Graph b

Here verticeo (u, f, e, h, w) are tranversed more than once. Therefore, there is no hamilton circuit.

Question 11

$m = 3$.

n (verticeo) $= 100$.

l (leaves) $= ?$

$$l = \frac{(m-1)n+1}{m}$$

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

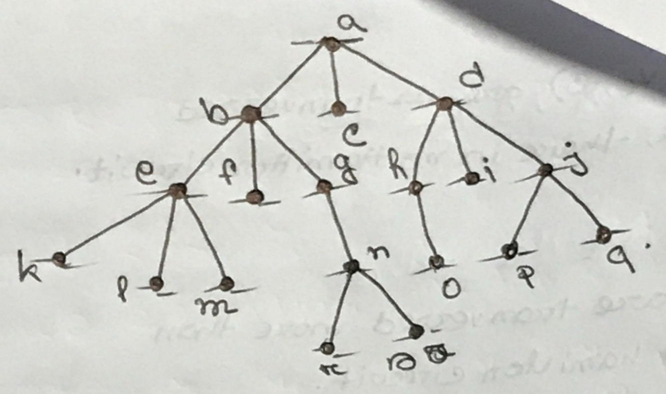
$$= \frac{200+1}{3}$$

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

$$= 67.$$

$\therefore$ there 67 leaves.

Question 12



a) root = a

b) Internal vertices = b, d, e, g, h, j, n.

c) leaves = k, l, m, r, s, o, c, p, q.

d) children of n = ~~r, s~~ r, s.

e) parents of e = b.

f) siblings of k = l and m

g) proper ancestors of q = ~~j, d,~~ a, d, j.

h) proper descendants of b = e, k, l, m, f, g, n, r, s.

Question 13

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

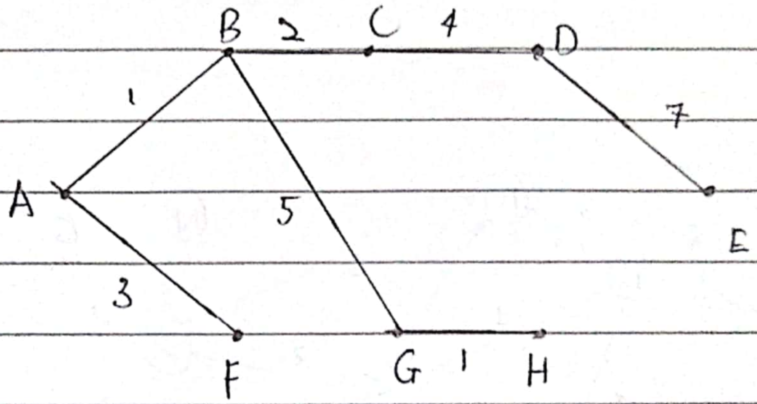
Inorder = k, e, l, m, b, f, g, r, n, s, a, c, o, h, d, i, e, j, q

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

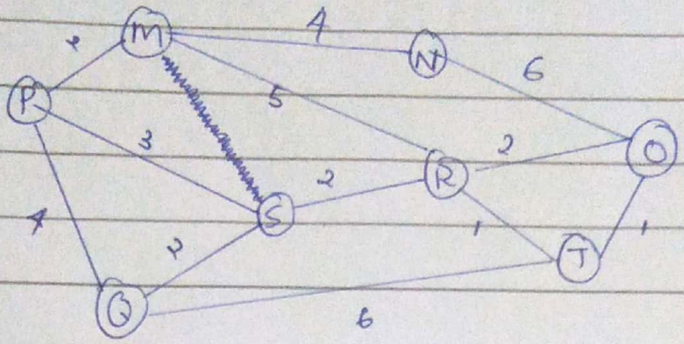
No.: .... Date: ....

14.

AB	1
GH	1
BC	2
AF	3
CD	4
FB	4
BG	5
GC	6
DH	6
GD	7
DE	7
HE	8
FG	8



15.



Solution:

Iteration	S	N	L(M)	L(P)	L(N)	L(R)	L(S)	L(O)	L(Q)	L(T)
0	{}	{m, P, N, R, S, O, Q, T}	0	∞	∞	∞	∞	∞	∞	∞
1	{m}	{P, N, R, S, O, Q, T}	0	2	4	5	∞	∞	∞	∞
2	{m, P}	{N, R, S, O, Q, T}	0	2	4	5	5	∞	6	∞
3	{m, P, N}	{R, S, O, Q, T}	0	2	4	5	5	10	6	∞
4	{m, P, N, R}	{S, O, Q, T}	0	2	4	5	5	7	6	6
5	{m, P, N, R, S}	{O, Q, T}	0	2	4	5	5	7	6	6
6	{m, P, N, R, S, Q}	{O, T}	0	2	4	5	5	7	6	6
7	{m, P, N, R, S, Q, T}	{O}	0	2	4	5	5	7	6	6

Shortest path M → R → T

Shortest length: 6.