UTM

UNIVERSITI TEKNOLOGI MALAYSIA

DISCRETE STRUCTURE (SECI 1013-03)

SEMESTER 1-2020/2021

ASSIGNMENT# 4

GROUP 13

GROUP MEMBERS:

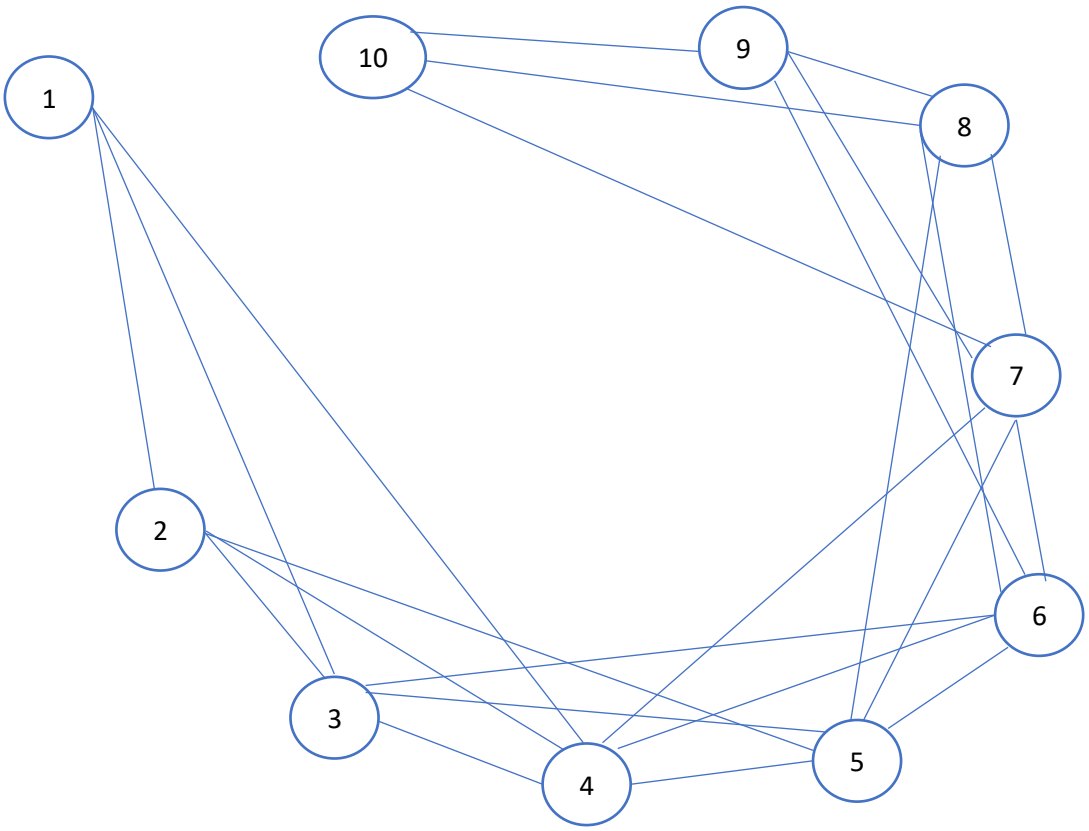
NAME	MATRIC NO.
1. LEE JIA XIAN	A20EC0200
2. RISHMA FATHIMA BINTI BASHER	A20EC0137
3. SAKINAH AL'IZZAH BINTI MOHD ASRI	A20EC0142

LECTURER'S NAME:

DR. NOR AZIZAH BINTI ALI

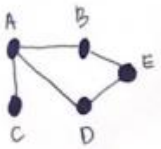
Question 1

24 edges



Question 2

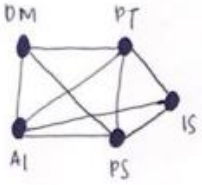
a)



$A_G =$

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

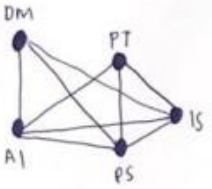
b) i -



$A_G =$

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

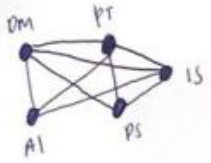
ii -



$A_G =$

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

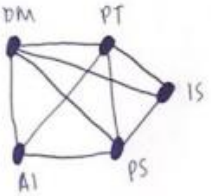
iii -



$A_G =$

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

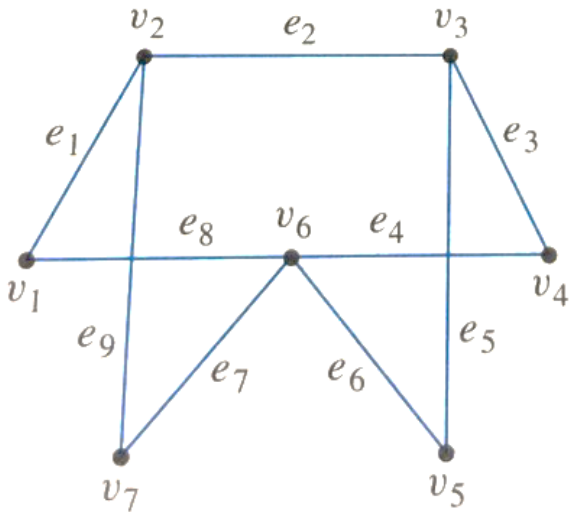
iv.

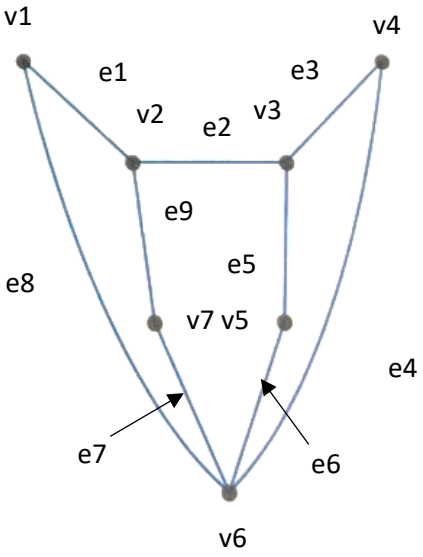


$A_G =$

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

Question 3





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Question 4

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

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

$$A_H = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{array}{c} \begin{array}{cccc} v_1 & v_2 & v_3 & v_4 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 \\ 0 & 1 & 1 & 0 \\ 0 & 2 & 0 & 0 \end{bmatrix} \end{array}$$

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

Question 5

a) Both graphs have 5 vertices and 5 edges.

Graph G1

$\deg(v1) = 2$
$\deg(v2) = 2$
$\deg(v3) = 3$
$\deg(v4) = 2$
$\deg(v5) = 1$

Graph G2

$\deg(u1) = 1$
$\deg(u2) = 3$
$\deg(u3) = 2$
$\deg(u4) = 2$
$\deg(u5) = 2$

Therefore, both graph is not isomorphic because the graph does not have same degrees for the corresponding vertices.

b) Both graphs have 5 vertices and 6 edges.

Graph H1

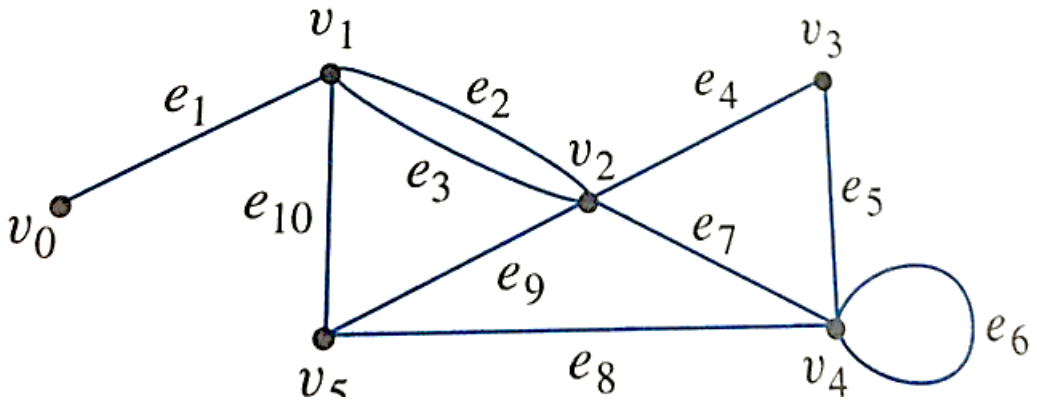
$\deg(a1) = 1$
$\deg(a2) = 1$
$\deg(a3) = 3$
$\deg(a4) = 2$
$\deg(a5) = 5$

Graph H2

$\deg(x1) = 3$
$\deg(x2) = 1$
$\deg(x3) = 3$
$\deg(x4) = 3$
$\deg(x5) = 2$

Therefore, both graph is not isomorphic because the graph does not have same degrees for the corresponding vertices.

Question 6



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

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

c) v_2 = vertex

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

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

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

Question 7

a) There are 3 paths.
b) There are 4 trails.
c) There are 0 walk.

Question 8

a)

Vertex	V1	V2	V3	V4	V5
Degree	2	4	2	4	4

Therefore, it is an eular circuit because every vertex is connected, and every vertex have even degree.

b)

Vertex	V0	V1	V2	V3	V4	V5	V6	V7	V8	V9
Degree	2	5	2	2	2	4	2	3	3	3

Therefore, it is an eular circuit because every vertex is connected, and every vertex have even degree.

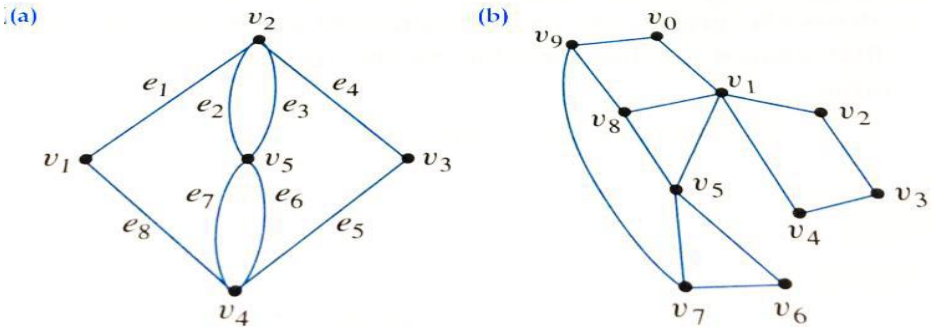
Hence, graph a is an eular circuit.

Question 9

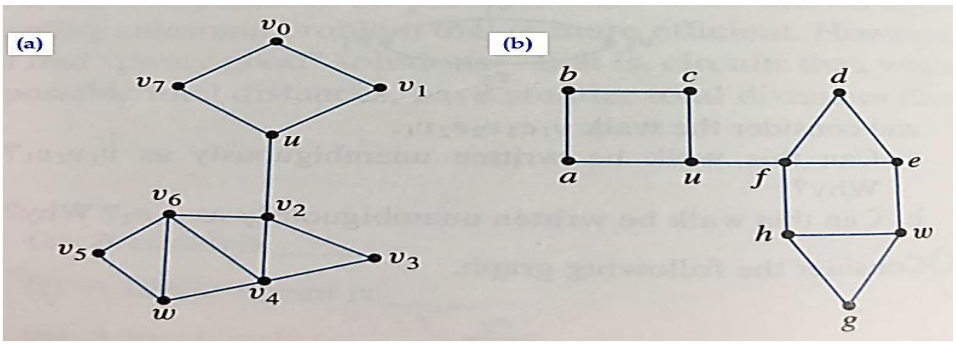
There is a Euler path from u to w at a).

The Euler path is (U, V_7,V_0,V_1,U,V_2,V_6,V_5,W,V_4,V_3,V_2,V_4,V_6,W)

Question 10



Answer: there is no Hamiltonian circuit in graph (a) – (b).



Answer: there is no Hamiltonian circuit in graph (a) – (b).

Question 11

m=ary tree=3

n=vertices=100

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

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

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

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

=67 leaves

Question 12

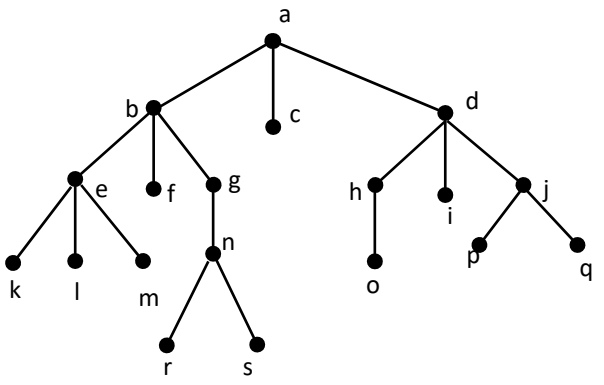
a) Root = a
b) Internal vertices = $i = \frac{n-1}{m}$

$$i = \frac{18-1}{3}$$

$$i = \frac{17}{3}$$

c) Leaf = b, e,k,l,m,f,g,n,r,s,c,d,h,o,I,j,p,q
d) Children of n = r, s
e) Parent of e = b
f) Siblings of k = l, m
g) Proper ancestor of q = j, d,a
h) Proper descendent of b = r, s,n,g,f,k,l,m,e

Question 13

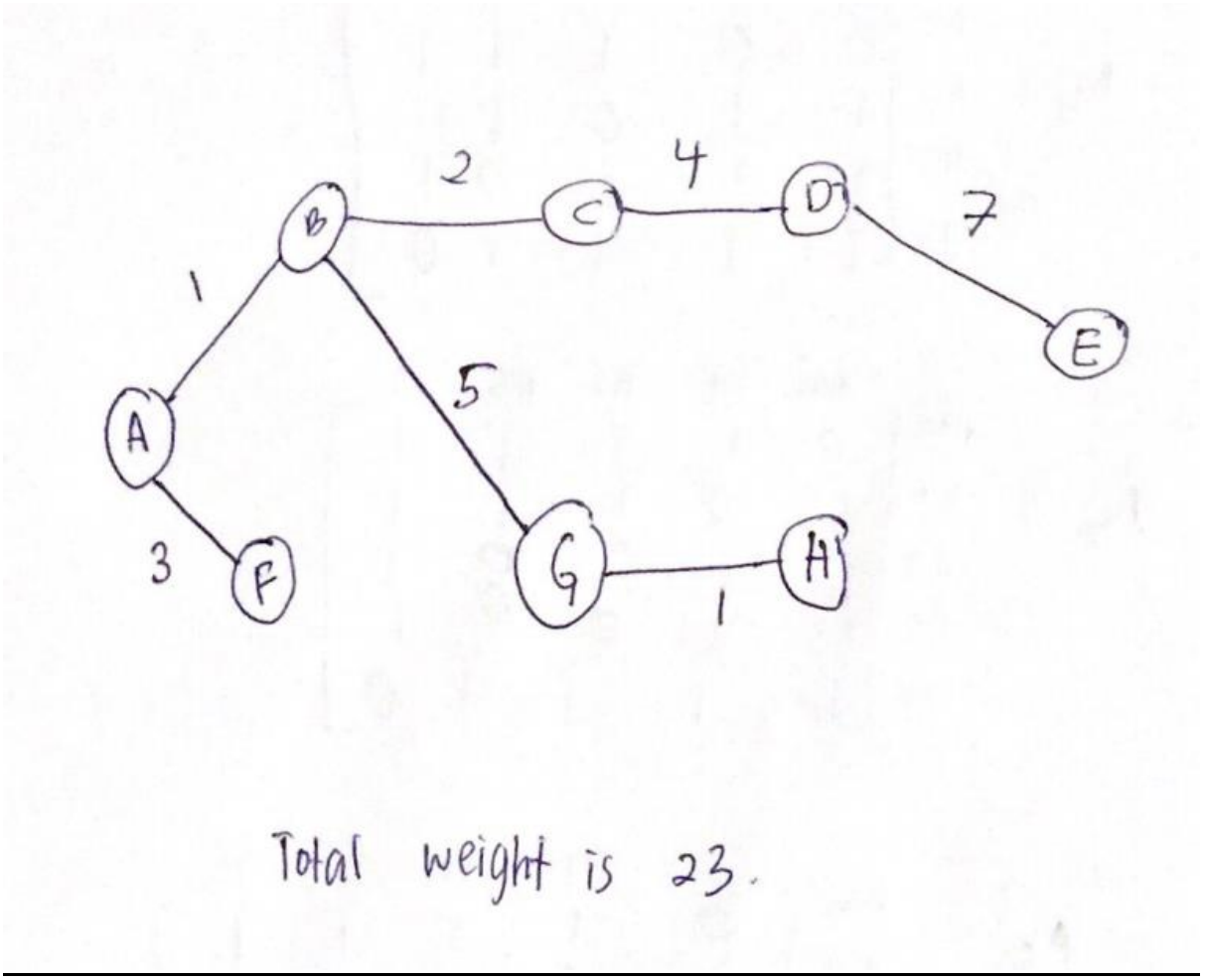


preorder: a, b, e, k, l, m, f, g, n, r, s, c, d, h, o, i, j, p, q

inorder: k, e, l, m, b, f, r, n, s, g, a, c, o, h, 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

Question 14



Question 15

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

The shortest path $= M \rightarrow N \rightarrow T$