UTM

UNIVERSITI TEKNOLOGI MALAYSIA

ASSIGNMENT 4 TUTORIAL 4

SCHOOL OF COMPUTING, FACULTY OF ENGINEERING

SECI 1013 | DISCRETE STRUCTURE

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SECTION 9

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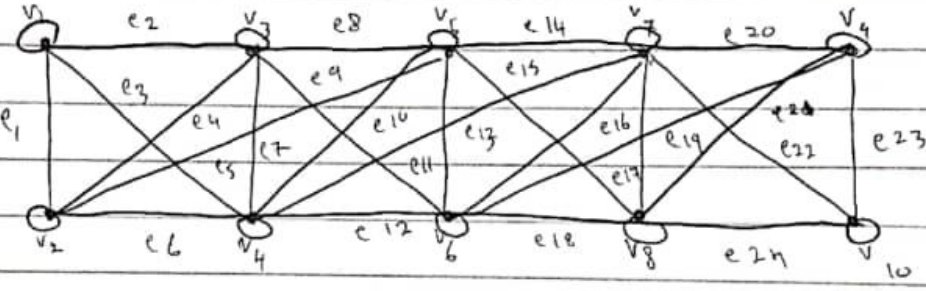
Question ①

$V(G_1) = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

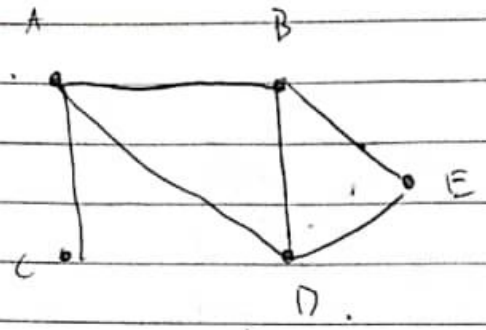


No. of values satisfying $|v-w| \leq 3 = 58$

$e(G_1) = 34$

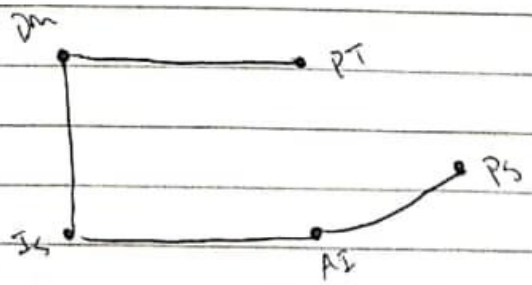
Question ②

a) A, B, C, D, E



$$A_G = \begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array} \begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

b)



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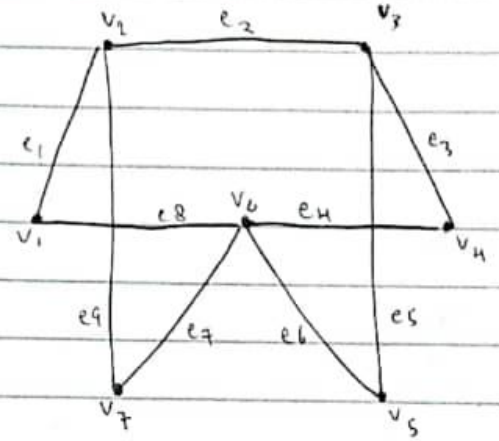
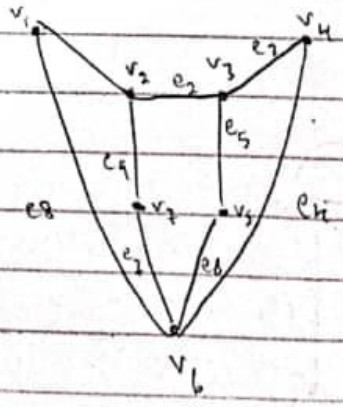
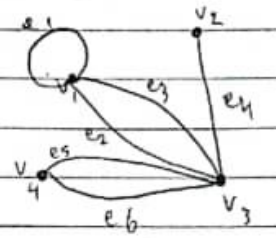
Question (3)





Question (4)

G:



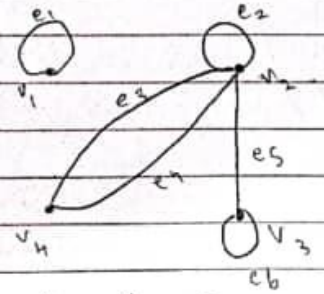
$A_G =$

	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

$I_G =$

	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:



$A_H =$

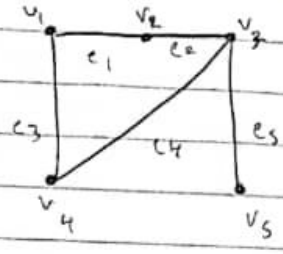
	v_1	v_2	v_3	v_4
v_1	1	0	0	0
v_2	0	1	1	2
v_3	0	1	1	0
v_4	0	2	0	0

$I_H =$

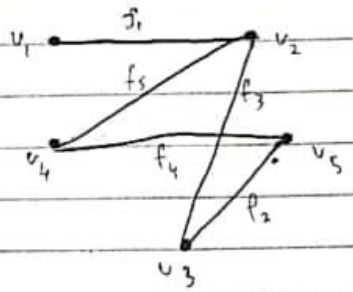
	e_1	e_2	e_3	e_4	e_5	e_6
v_1	2	0	0	0	0	0
v_2	0	2	1	1	1	0
v_3	0	0	0	0	1	2
v_4	0	0	1	1	0	0

No.: Date:

Question (5)



G_1



G_2

No of edges:

G_1 : 5

G_2 : 5

No of vertices:

G_1 : 5

G_2 : 5

degree sequence

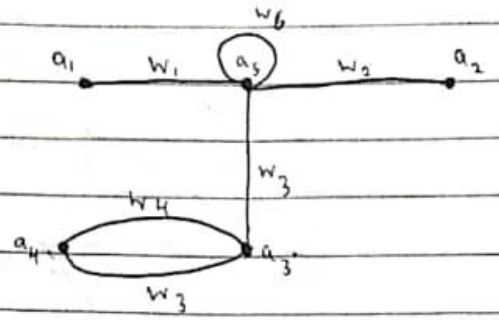
G_1: 3, 2, 2, 2, 1

G_2: 3, 2, 2, 2, 1

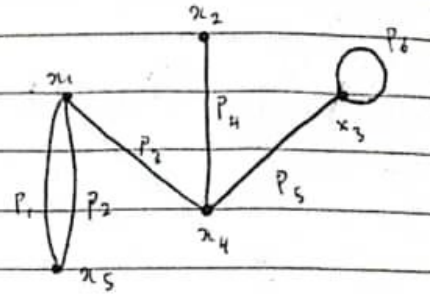
∴ G_1 and G_2 are Isomorphic

between $v_1 - v_5$, $v_2 - v_3$, $v_3 - v_2$, $v_4 - v_4$, $v_5 - v_1$

b)



H_1



H_2

No of edges :

$H_1 = 6$

$H_2 = 6$

No of vertices :

$H_1 : 5$

$H_2 : 5$

degree sequence

$H_1 : (5), 3, 2, 1, 1$

$H_2 : 3, 3, 2, 2, 1$

$\therefore$ H_1 and H_2 are not isomorphic

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 = , trivial walk

d) $v_5\ e_9\ v_2\ e_4\ v_3\ e_5\ v_4\ e_6\ v_4\ e_8\ v_5$ = circuits / cycle

e) $v_2\ e_4\ v_3\ e_5\ v_4\ e_8\ v_5\ e_9\ v_2\ e_7\ v_4\ e_5\ v_3\ e_4\ v_2$: closed walk

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

Question 7

a) 3 - $v_1, e_1, v_2, e_2, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_3, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_4, v_3, e_5, v_4$

b) 9 - $v_1, e_1, v_2, e_2, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_3, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_4, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_2, v_3, e_3, v_2, e_4, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_4, v_3, e_3, v_2, e_2, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_4, v_3, e_2, v_2, e_3, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_2, v_3, e_4, v_2, e_3, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_3, v_3, e_2, v_2, e_4, v_3, e_5, v_4$
- $v_1, e_1, v_2, e_3, v_3, e_4, v_2, e_2, v_3, e_5, v_4$

c) : infinity

Question 8

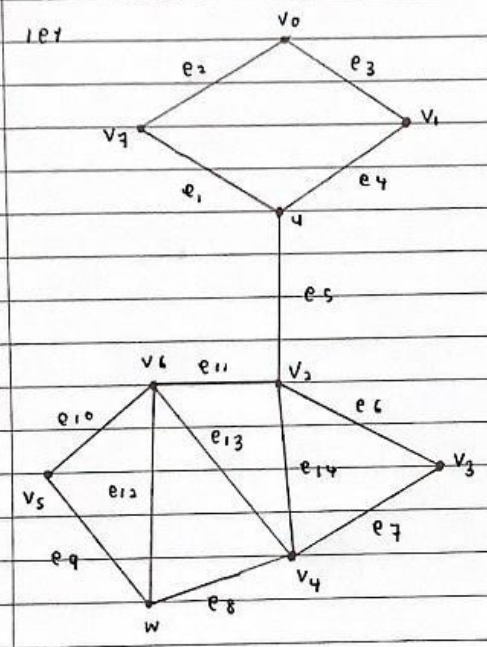
a) have Euler circuit.

$v_1, e_1, v_2, e_2, v_5, e_7, v_4, e_6, v_5, e_3, v_2, e_4, v_3, e_5, v_4, e_8, v_1$

b) does not have euler circuit,
because a graph has a Euler circuit if and only if it is a connected graph and every vertex in the graph has positive even degree.
in graph (b) - v_9 has 3 degree
- v_1 has 5 degree
- v_8 has 3 degree
- v_7 has 3 degree

Question 9

a) let

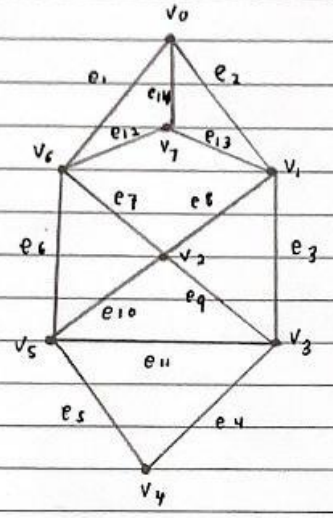


have Euler path,
$(u, e_1, v_7, e_2, v_0, e_3, v_1, e_4, u, e_5, v_2, e_6, v_3, e_7, v_4, e_{14}, v_2, e_{11}, v_6, e_{13}, v_4, e_8, w, e_9, v_5, e_{10}, v_6, e_{12}, w)$

b) graph b don't have Euler path.

Question 10

a) let



graph (a) has hamiltonian circuit

$(v_0, e_1, v_6, e_6, v_5, e_5, v_4, e_4, v_3, e_9, v_2, e_8, v_1, e_{13}, v_7, e_{14}, v_0)$

b) graph (b) did not have hamiltonian circuit.

QUESTION 11

How many leaves does a full 3-ary tree with 100 vertices have?

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

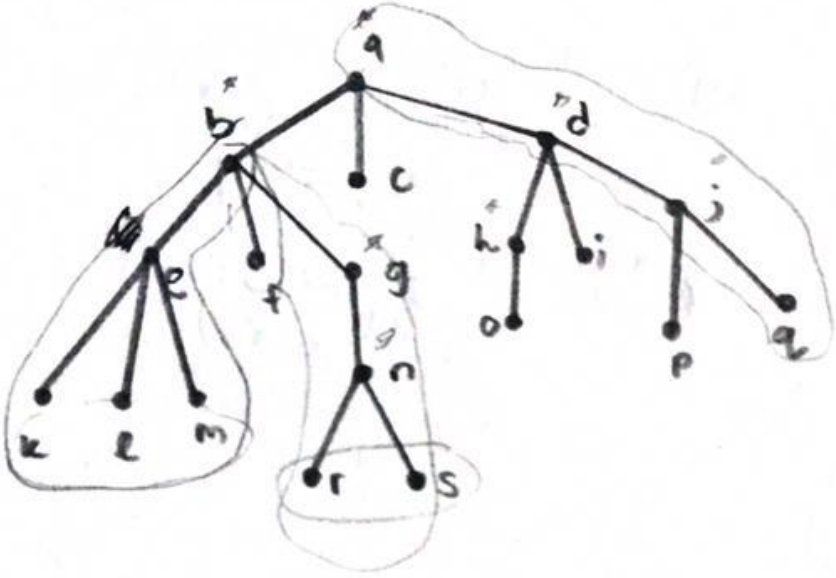
$m = 3$ $\quad n = 100$

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

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

$$= \frac{201}{3} = 67$$

QUESTION 12



a) Root

= a

b) Internal vertices

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

c) Leaves

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

d) Children of n

= r, s

e) Parent of e

= b

f) siblings of k

= l, m

g) Proper ancestors of q

= a, d, j

h) Proper descendant of b

= e, k, l, m, f, g, n, r, s

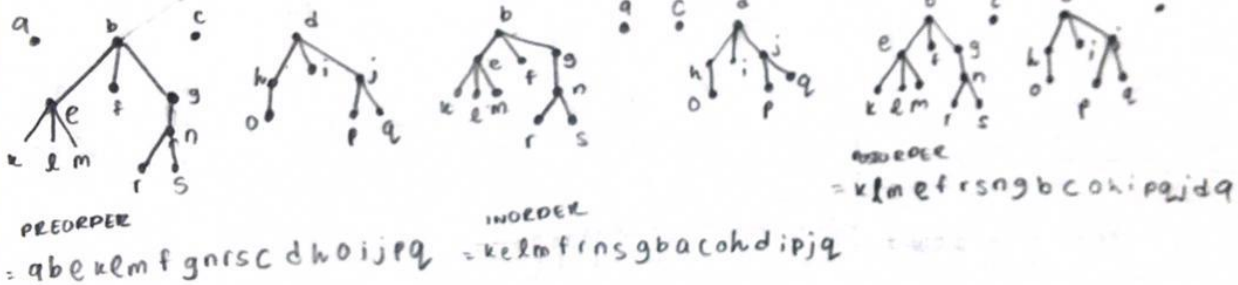
QUESTION 13

In which order are the vertices of ordered rooted tree in figure 1 is visited using preorder, inorder and postorder.

PREORDER — root, left, right

INORDER — left, root, right

POSTORDER — left, right, root



PREORDER
= abekℓmfgnrscdhoijpq

INORDER
= kelmfrnsgbacohdipjq

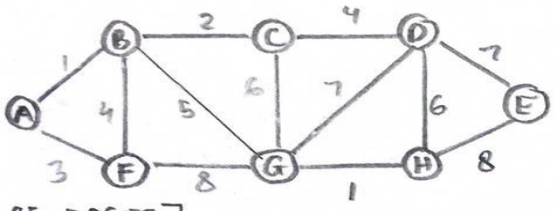
POSTORDER
= klmefrsngbcohipqjda

∴ PREORDER = abekℓmfgnrscdhoijpa

INORDER = kelmfrnsgbacohdipjq

POSTORDER = klmefrsngbcohipqjda

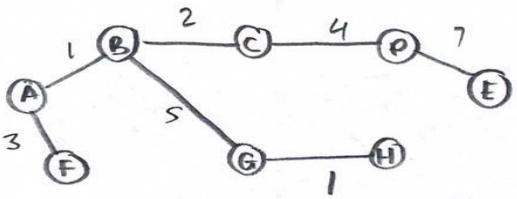
QUESTION 14



[LIST OF EDGES]

AB	1
GH	1
BC	2
AF	3
FB	4
CD	4
BG	5 ?
CG	6
DH	6
GD	7
DE	7
EH	8
FG	8

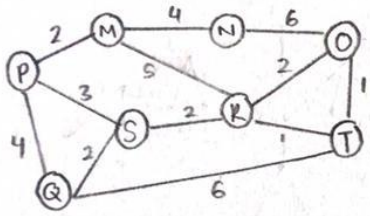
AB = 1
GH = 1
BC = 2
AF = 3
CD = 4
BG = 5
DE = 7



T = 1 + 2 + 3 + 4 + 5 + 1 + 7

= 23 #

QUESTION 15



∴ shortest path from M → T is (P, S, R, T) with length 6.

M → T

NO	S		L(M)	L(N)	L(P)	L(Q)	L(R)	L(S)	L(O)	L(T)
0	{}	{M,N,O,P,Q,R,S,T}	0	∞	∞	∞	∞	∞	∞	∞
1	{M}	{N,O,P,Q,R,S,T}		4	2	∞	5	∞	∞	∞
2	{M,P}	{N,O,Q,R,S,T}		4	(2)	6	5	5	∞	∞
3	{M,P,N}	{O,Q,R,S,T}		(4)		6	5	5	10	∞
4	{M,P,N,R}	{O,Q,S,T}				6	(5)	5	7	6
5	{M,P,N,R,S}	{O,Q,T}				6		(5)	7	6
6	{M,P,N,R,S,Q}	{O,T}				(6)			7	6
7	{M,P,N,R,S,Q,T}	{O}							7	(6)