UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SECI 1013
DISCRETE STRUCTURE

Assignment 4

Lecturer:

Dr Razana Alwee

Group 5

Team Members:

Heong Yi Qing (A20EC0043)

Nik Syahdina Zulaikha binti Badrul Hisham (A20EC0108)

Saidah Binti Saiful Bahari (A20EC0141)

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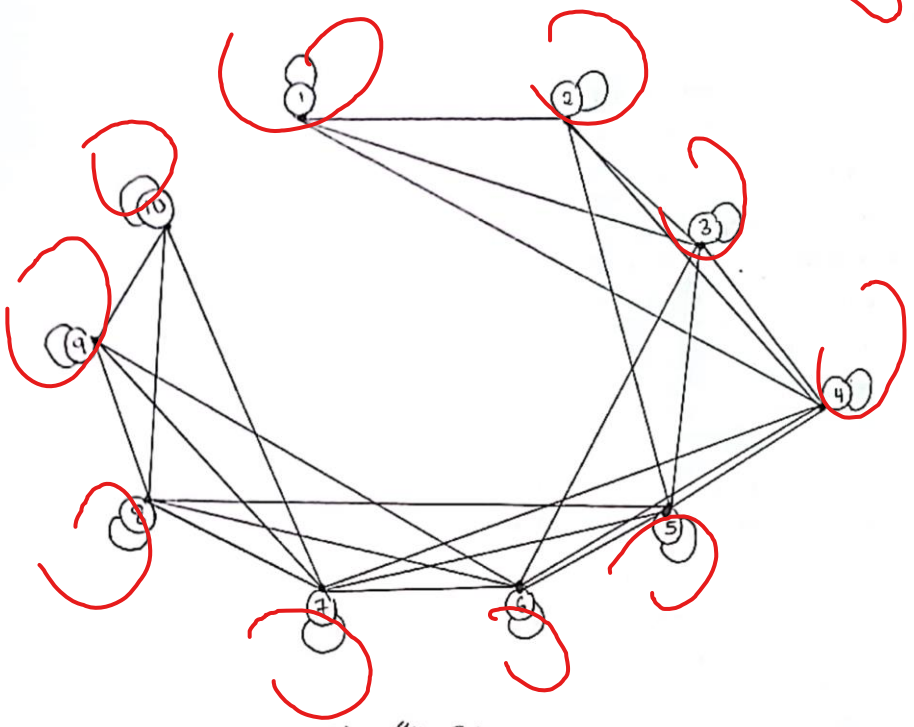
Question 1

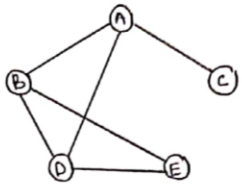


Number of edges, $e(G) = 34$

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

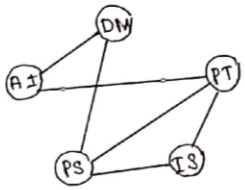
Question 2

a) A = Ahmad , B = Batri , C = Chong , D = David , E = Ehsan



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

b) 5 subjects in exam DM, AI, PT, PS, IS



$$A = \begin{array}{c} \\ DM \\ AI \\ PT \\ PS \\ Is \end{array} \begin{array}{c} \begin{array}{ccccc} DM & AI & PT & PS & IS \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

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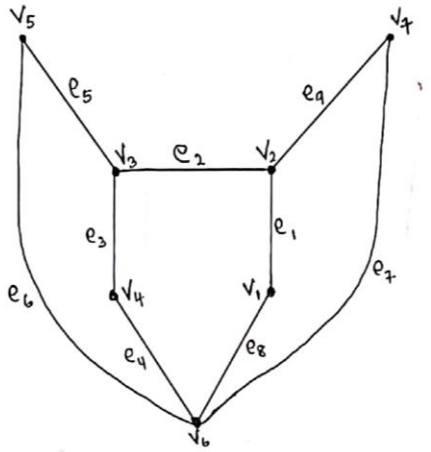
Question 3



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Question 4

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

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

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

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

Question 5

a) Vertices : $G_1 = 5$; $G_2 = 5$

Edges : $G_1 = 5$; $G_2 = 5$

Degree of vertex : G_1 = 1 vertex has degree of 1, 1 vertex has degree of 3, 3 vertices have degree of 2

G_2 = 1 vertex has degree of 1, 1 vertex has degree of 3, 3 vertices have degree of 2

Define function $f : G_1 \rightarrow G_2$

$f(V_1) = U_5$, $f(V_2) = U_3$, $f(V_3) = U_2$, $f(V_4) = U_4$, $f(V_5) = U_1$

$$A_{G_1} = \begin{array}{c} \\ V_1 \\ V_2 \\ V_3 \\ V_4 \\ V_5 \end{array} \begin{array}{c} \begin{array}{ccccc} V_1 & V_2 & V_3 & V_4 & V_5 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

$$A_{G_2} = \begin{array}{c} \\ U_5 \\ U_3 \\ U_2 \\ U_4 \\ U_1 \end{array} \begin{array}{c} \begin{array}{ccccc} U_5 & U_3 & U_2 & U_4 & U_1 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

Since $A_{G_1} = A_{G_2}$, G_1 and G_2 are isomorphic

b) Vertices : $H_1 = 5$; $H_2 = 5$

edges : $H_1 = 6$; $H_2 = 6$

Degree of vertex : H_1 = 2 has degree of 1, 1 has degree of 2, 1 has degree of 3, 1 has degree of 4

H_2 = 1 has degree of 1, 1 has degree of 2, 3 has degree of 3

Since the degree of vertex is not same, thus H_1 and H_2 are not isomorphic

Question 6

a) trail
b) walk
c) trivial walk
d) circuit / cycle
e) closed walk
f) path

6

Question 7

a) three
b) nine
c) infinite

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Question 8

a) Has an euler circuit as it has all even degree of vertex

$(V_1, e_1, V_2, e_3, V_5, e_7, V_4, e_6, V_5, e_8, V_2, e_4, V_3, e_5, V_4, e_9, V_1)$

b) Does not have euler circuit as it has ~~vetic~~ vertices that has odd degree which is V_1, V_7, V_9.

Question 9

a) Does not have euler path since ~~it~~ it have odd degree of vertices ~~whic~~ at vertex u and w.

b) Does not have euler path since it have odd degree of vertices at vertex u, e, h and w.

Question 10

~~Gra~~ Graph (a) and (b) does not have hamiltonian circuit

Question 11

$n = 100$

$m = 3$

$l = ?$

$$n = \frac{ml - 1}{m - 1}$$

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

$$200 = 3l - 1$$

$$l = 67$$

leaves = 67

Question 12

a) root = a
b) internal vertices = b, d, e, g, h, n, 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 descendents of b = e, f, g, k, l, m, n, r, s

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, g, r, n, s, 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

Edge Weight :

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

Total weight = 1 + 1 + 2 + 3 + 4 + 5 + 7
= 23

Question 15

No.	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}		4	∞	2	∞	5	∞	∞
2	{M,P}	{N,O,Q,R,S,T}			∞		6		5	∞
3	{M,P,S}	{N,O,Q,R,T}			∞					∞
4	{M,P,N,S}	{O,Q,R,T}			10					∞
5	{M,P,N,S,Q}	{O,R,T}			10					12
6	{M,P,N,S,Q,R}	{O,T}			7					6
7	{M,P,N,S,Q,R,T}	{O}								

The Shortest path is M-R-T

Minimum distance from M to T is 6

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