UTM
UNIVERSITI TEKNOLOGI MALAYSIA

TUTORIAL 4

GROUP NAME : T5

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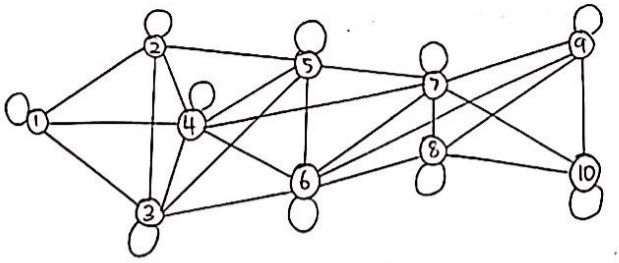
SECTION : SECI1013 – 09

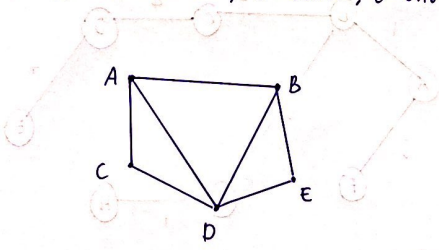
1) Graph G :



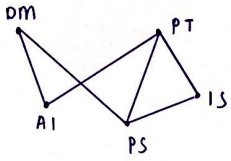
e(G) = 33

Question 2

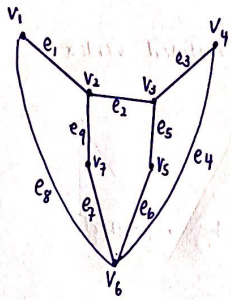
2 a) Let A= Ahmad, B = Bakri, C = Chong, D = David, E = Ehsan.



b) Let DM = discrete Mathematics, PT = Programming Technique, AI = Artificial Inteligence, PS = Probability statistic, IS = Information system.



Question 3



Question 4

Graph G:

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

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

Graph H:

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

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

5) a) - Both G_1 and G_2 have 5 vertices and 5 edges
- Both G_1 and G_2 are connected and simple graph
- Both G_1 and G_2 have 1 vertex with 1 degree, 3 vertices with 2 degrees and 1 vertex with 3 degrees
- $f : G_1 \to G_2$

$f(v_1) = u_5$
$f(v_2) = u_4$
$f(v_3) = u_2$
$f(v_4) = u_3$
$f(v_5) = u_1$

$M_{G_1} =$

	v_1	v_2	v_3	v_4	v_5
v_1	0	1	0	1	0
v_2	1	0	1	0	0
v_3	0	1	0	1	1
v_4	1	0	1	0	0
v_5	0	0	1	0	0

$M_{G_2} =$

	u_5	u_4	u_2	u_3	u_1
u_5	0	1	0	1	0
u_4	1	0	1	0	0
u_2	0	1	0	1	1
u_3	1	0	1	0	0
u_1	0	0	1	0	0

Since $M_{G_1} = M_{G_2}$
$\therefore$ G_1 and G_2 are isomorphic

b) - Both have 5 vertices and 6 edges
- Both are connected and simple graph
- Both have 1 loop and 1 pair of parallel edges

However, H_1 has 2 vertices with 1 degree, 1 vertex with 2 degrees, 1 vertex with 3 degrees and 1 vertex with 5 degrees while H_2 has 1 vertex with 1 degree, 1 vertex with 2 degrees and 3 vertices with 3 degrees
$\therefore$ H_1 and H_2 are not isomorphic

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

7) a) path 1 : $v_1 e_1 v_2 e_2 v_3 e_5 v_4$
path 2 : $v_1 e_1 v_2 e_3 v_3 e_5 v_4$
path 3 : $v_1 e_1 v_2 e_4 v_3 e_5 v_4$
Total : 3 paths

b) trail 1 : $v_1 e_1 v_2 e_2 v_3 e_3 v_2 e_4 v_3 e_5 v_4$
trail 2 : $v_1 e_1 v_2 e_2 v_3 e_4 v_2 e_3 v_3 e_5 v_4$
trail 3 : $v_1 e_1 v_2 e_3 v_2 e_2 v_2 e_4 v_3 e_5 v_4$
trail 4 : $v_1 e_1 v_2 e_3 v_2 e_4 v_2 e_2 v_3 e_5 v_4$
trail 5 : $v_1 e_1 v_2 e_4 v_3 e_2 v_2 e_3 v_3 e_5 v_4$
trail 6 : $v_1 e_1 v_2 e_4 v_3 e_3 v_2 e_2 v_3 e_5 v_4$
Total : 6 trails

c) ∞ walks
Since all vertices and edges can be repeated as many times as possible
$\therefore$ There are infinite numbers of walks

9) a)

Vertex	v_1	v_2	v_3	v_4	v_5
Degree	2	4	2	4	4

Since the degree of all vertices are even
∴ The graph has Euler circuit

Euler circuit: $v_1 e_1 v_2 e_2 v_5 e_3 v_2 e_4 v_3 e_5 v_4 e_6 v_5 e_7 v_4 e_8 v_1$

b)

Vertex	v_0	v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_9
Degree	2	5	2	2	2	4	2	3	3	3

Since not all vertices have even degrees
(v_1, v_7, v_8 and v_9 have odd degree)
∴ The graph has no Euler circuit

9.

a) $(u, v_1, v_0, v_7, u, v_2, v_3, v_4, v_6, v_2, v_4, w, v_3, v_6, w)$

b) no euler path

Question 10

a) - There is Hamilton circuit in graph (a). Hamilton circuit in this graph is $V_0, V_7, V_1, V_2, V_3, V_4, V_5, V_6, V_0$.

- Because there is no repeated vertex other than the first and last vertex.

b) - There is no Hamilton circuit in graph (b) since there will be repeated vertex other than the first and last vertex.

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

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

$= \frac{201}{3}$

= 67 leaves

12. a) a

b) a, b, d, e, g, h, i, n.

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

d) r, s.

e) b

f) l, m.

g) i, d, a

h) e, f, g, k, l, m, n, r, s.

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, f, r, n, s, g, b, a, c,

o, h, d, i, p, j, q

post order:

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

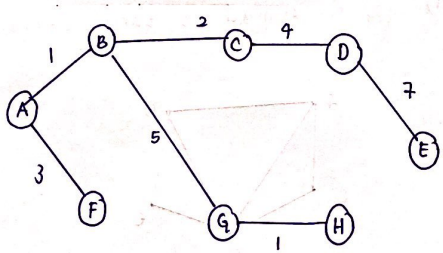
i, p, q, j, d, a

Question 14

~~AB 1~~
~~GH 1~~
~~BC 2~~
~~AF 3~~
~~BF 4~~
~~CD 4~~
~~BG 5~~
~~CG 6~~
~~DH 6~~
~~BG 7~~
~~DE 7~~
~~FG 8~~
~~HE 8~~

MST

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



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

= 23

15.

V	M	N	O	P	Q	R	S	T
M	0	4	∞	2	∞	5	∞	∞
N	0	4	10	2	∞	5	∞	∞
O	0	4	10	2	∞	5	∞	11
P	0	4	10	2	6	5	5	11
Q	0	4	10	2	6	5	5	11
R	0	4	10	2	6	5	5	6
S	0	4	10	2	6	5	5	6

the shortest path from M to T is by M, R, T, where the length is 6.