FACULTY OF COMPUTING
DISCRETE STRUCTURE
(SECI1013)
ASSIGNMENT 3

SEMESTER I 2024/25

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SECTION : **SECTION 3**

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Chapter 35

1. Math : M, Chemistry : C , Biology : B , Physics : P

i) Given : $M = 4C$ (1) , $C = 2B$ (2) , $B = P$ (3).

Sub (2) to (1) , $M = 8B$

Total element in S : $8B + 2B + B + B = 12B$

$P(M) = \frac{8B}{12B} = \frac{2}{3}$

$P(C) = \frac{2B}{12B} = \frac{1}{6}$

$P(B) = \frac{B}{12B} = \frac{1}{12}$

$P(P) = \frac{B}{12B} = \frac{1}{12}$

ii) $P(M \cup B) = P(M) + P(B) - P(M \cap B)$ You can't choose two book at once,

As choosing M and choosing B is mutually exclusive, $P(M \cap B) = 0$,

$P(M \cup B) = 0.6 + 0.1 = 0.7$

2. i) Given A and B are mutually exclusive ,

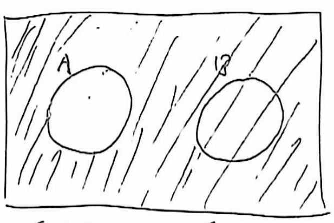
$P(A \cup B) = P(A) + P(B) = 0.4 + 0.5 = 0.9$

ii) $P(A^c) = 1 - P(A) = 1 - 0.4 = 0.6$

iii) As set B is fully covered by A^c,

therefore $P(A^c \cap B) = P(B) = 0.5$

S



Shaded area = A^c

3. i) E = Grand prize , second prize , third prize ;

$|E| = 3$, $|S| = 100$

$P(WM) = \frac{3}{100} = 0.03$

4. P = Has pneumonia problem , S = Is smoker ,

$P(P) = 0.4$, $P(S \mid P) = 0.8$, $P(S \mid P') = 0.3$

i) $P(P') = 1 - 0.4 = 0.6$

ii) $P(P \mid S) = \frac{P(S \mid P) \times P(P)}{P(S)}$

$= \frac{P(S \mid P) \times P(P)}{P(S \mid P') \times P(P') + P(S \mid P) \times P(P)}$

$= \frac{0.8 \times 0.4}{0.3 \times 0.6 + 0.8 \times 0.4}$

$= \frac{0.32}{0.5} = 0.64$

5) As replacement is done , probability of getting black boot 2nd time , P(B) is not affected by the first pick.

Therefore, picking boots for first time and second time are Mutually exclusive event.

P(Getting Black pair Both Times) $= \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

Chapter 4

1)

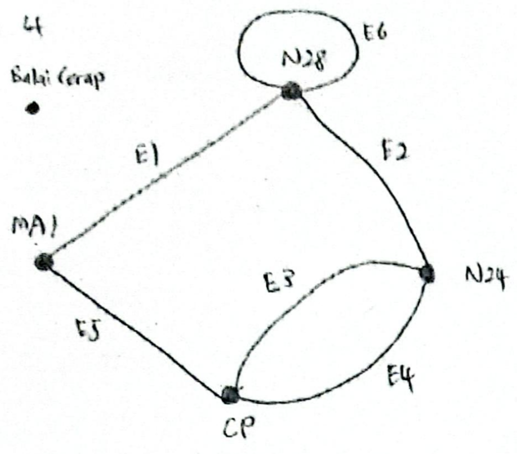


Diagram of graph

a). The vertices are each angle points in a graph.
The vertices in this diagram are MA1, N28, N24, CP.

b) The edges are line connecting two endpoints in graph.
The edges in this diagram are E1, E2, E3, E4, E5, E6.

c) Adjacent vertices are two vertices connected by one edge.
In this diagram, MA1 and N28 are adjacent.
N28 is also adjacent to itself.

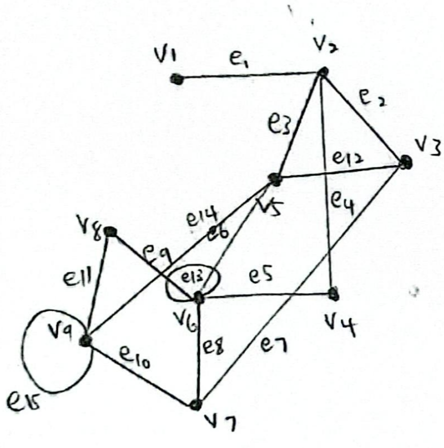
d) Incident edge is edge that connected to that vertices.
In this diagram, E3 and E4 are incident on CP and N24.
E1 is incident on MA1 and N28, E6 is incident on N28.

e) Isolated vertex are vertices that are not connected by edges.
In this diagram, Balai Cerap is the isolated vertex.

f) Loop is edge that start from one point and end in one point.
In this diagram, the loop is E6, start and end at N28.

g) Parallel edge are two or more edge connecting same vertices.
In this diagram, its example is E3 and E4,
both connecting same vertices which is N24 and CP.

2) 4)



i) $v_1 = 1$

$v_2 = 4$

$v_3 = 3$

$v_4 = 2$

$v_5 = 4$

$v_6 = 6$

$v_7 = 3$

$v_8 = 2$

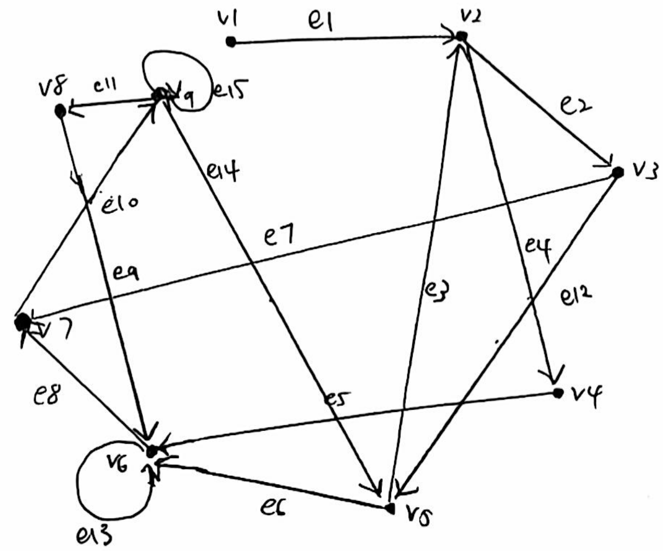
$v_9 = 5$

ii)

	v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_9
v_1	0	1	0	0	0	0	0	0	0
v_2	1	0	1	1	1	0	0	0	0
v_3	0	1	0	0	1	0	1	0	0
v_4	0	1	0	0	0	1	0	0	0
v_5	0	1	1	0	0	1	0	0	1
v_6	0	0	0	1	1	1	1	1	0
v_7	0	0	1	0	0	1	0	0	1
v_8	0	0	0	0	0	1	0	0	1
v_9	0	0	0	0	1	0	1	1	1

	e_1	e_2	e_3	e_4	e_5	e_6	e_7	e_8	e_9	e_{10}	e_{11}	e_{12}	e_{13}	e_{14}	e_{15}
v_1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
v_2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
v_3	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
v_4	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
v_5	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0
v_6	0	0	0	0	1	1	0	1	1	0	0	0	2	0	0
v_7	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0
v_8	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
v_9	0	0	0	0	0	0	0	0	0	1	1	0	0	1	2

b)



i)

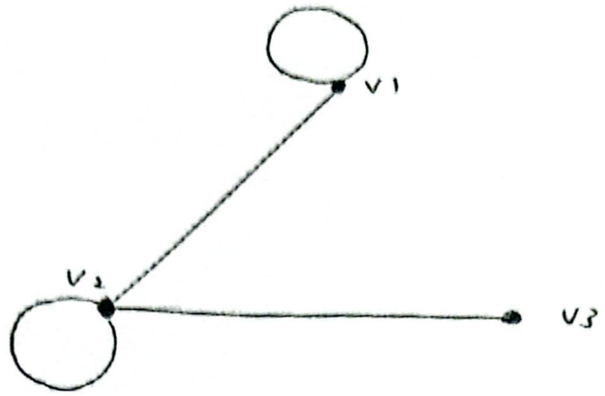
	In	Out
v1	0	1
v2	2	2
v3	1	2
v4	1	1
v5	2	2
v6	4	2
v7	2	1
v8	1	1
v9	2	3

ii)

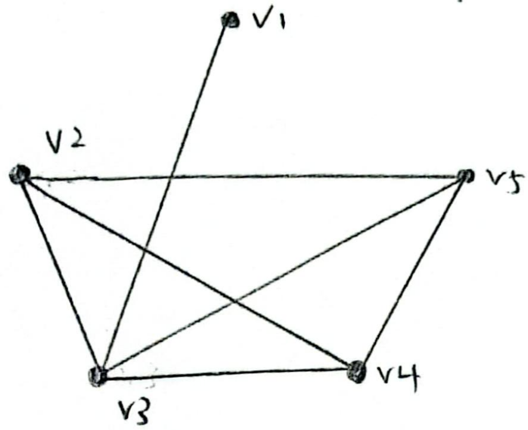
$$
\begin{array}{c|c}
 & \begin{matrix} v1 & v2 & v3 & v4 & v5 & v6 & v7 & v8 & v9 \end{matrix} \\
\begin{matrix} v1 \\ v2 \\ v3 \\ v4 \\ v5 \\ v6 \\ v7 \\ v8 \\ v9 \end{matrix} &
\begin{bmatrix}
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1
\end{bmatrix}
\end{array}
$$

$$
\begin{array}{c|c}
 & \begin{matrix} e1 & e2 & e3 & e4 & e5 & e6 & e7 & e8 & e9 & e10 & e11 & e12 & e13 & e14 & e15 \end{matrix} \\
\begin{matrix} v1 \\ v2 \\ v3 \\ v4 \\ v5 \\ v6 \\ v7 \\ v8 \\ v9 \end{matrix} &
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-1 & -1 & -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & -1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & -1 & 0 & -1 & 0 \\
0 & 0 & 0 & 0 & -1 & -1 & 0 & 1 & -1 & 0 & 0 & 0 & -1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & -1 & -1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & -1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 & 1 & -1
\end{bmatrix}
\end{array}
$$

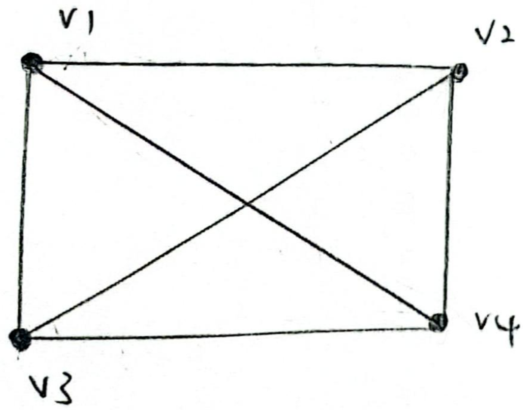
3. a)



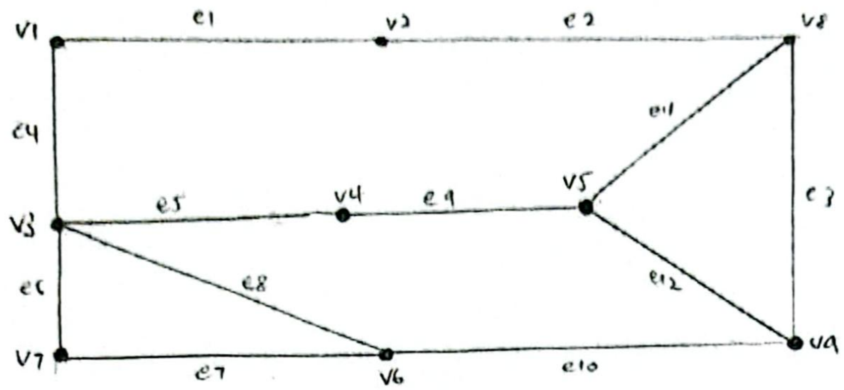
b)



c)



4)



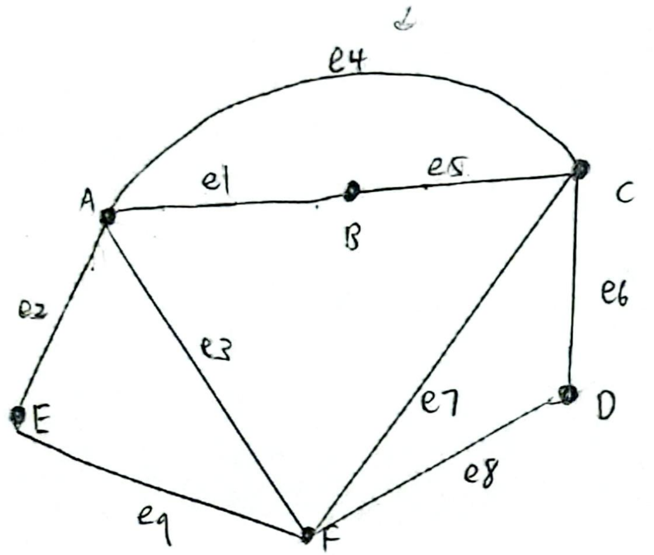
i) (v1, e1, v2, e2, v8, e3, v9) → 3 Edges
(v1, e1, v2, e2, v8, e11, v5, e12, v9) → 4 Edges
(v1, e4, v3, e6, v7, e7, v6, e10, v9) → 4 Edges
(v1, e4, v3, e8, v6, e10, v9) → 3 Edges
(v1, e4, v3, e5, v4, e9, v5, e12, v9) → 4 Edges
(v1, e4, v3, e5, v4, e9, v5, e11, v8, e3, v9) → 5 Edges
(v1, e1, v2, e2, v8, e11, v5, e9, v4, e5, v3, e6, v7, e7, v6, e10, v9) → 8 Edges
(v1, e1, v2, e2, v8, e11, v5, e9, v4, e5, v3, e8, v6, e10, v9) → 7 Edges

ii) All the answer in (i) with the addition of repeating vertices case which is:
(v1, e4, v3, e8, v6, e7, v7, e6, v3, e5, v4, e9, v5, e11, v8, e3, v9) → 8 Edges
(v1, e4, v3, e8, v6, e7, v7, e6, v3, e5, v4, e9, v5, e12, v9) → 7 Edges
(v1, e4, v3, e6, v7, e7, v6, e8, v3, e5, v4, e9, v5, e12, v9) → 7 Edges
(v1, e4, v3, e6, v7, e7, v6, e8, v3, e5, v4, e9, v5, e11, v8, e3, v9) → 8 Edges

iii) (v1, e1, v2, e2, v8, e3, v9) and (v1, e4, v3, e8, v6, e10, v9) are shortest path with 3 edges.
(v1, e1, v2, e2, v8, e11, v5, e9, v4, e5, v3, e6, v7, e7, v6, e10, v9) is longest path with 8 Edges

iv) (v1, e1, v2, e2, v8, e3, v9) and (v1, e4, v3, e8, v6, e10, v9) are shortest trail with 3 edges.
(v1, e1, v2, e2, v8, e11, v5, e9, v4, e5, v3, e6, v7, e7, v6, e10, v9),
(v1, e4, v3, e8, v6, e7, v7, e6, v3, e5, v4, e9, v5, e11, v8, e3, v9) and
(v1, e4, v3, e6, v7, e7, v6, e8, v3, e5, v4, e9, v5, e11, v8, e3, v9)
are the longest trail with 8 edges.

5)



A : 4
B : 2
C : 4
D : 2
E : 2
F : 4

This is a connected graph, and every vertex has even degree, therefore G contains Euler Circuit.

Euler Trail also exist as the graph contains Euler Circuit. (Euler Circuit ⊂ Euler Trail)

a) (E, e_2, A, e_4, C, e_5, B, e_1, A, e_3, F, e_7, C, e_6, D, e_8, F, e_9, E)

Each vertex is used at least once and each edges are used only one time.

b) (A, e_4, C, e_6, D, e_8, F, e_9, E, e_2, A, e_3, F, e_7, C, e_5, B, e_1, A)

Each vertex is used at least once, have even degree, each edges are only used one time, and the graph start from A and end at A. (same endpoint)

c) (A, e_2, E, e_9, F, e_8, D, e_6, C, e_5, B, e_1, A)

Each vertex except endpoint appears exactly once, start and end in same vertex.

d) Euler circuit must contain all edges but hamilton circuit does not neccessarily contain all edges. & Euler circuit may visits one vertex more than one time but hamilton circuit only visits each vertex once.