UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SEMESTER 1 2023/2024

SECI1013 – DISCRETE STRUCTURE

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SECTION 3

ASSIGNMENT 3

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1. (a) pigeon = student = n

pigeonholes = 101

$k = 2$

$1 < \frac{n}{101} \leq 2$

$\frac{n}{101} > 1$ $\quad$ $\frac{n}{101} \leq 2$

$n > 101$ $\quad$ $n \leq 202$

$101 < n \leq 202$

5

(b) pigeon = student = n

pigeonhole = grade (A, B, C, D, F)

$k = 6$

$5 < \frac{n}{5} \leq 6$

$\frac{n}{5} > 5$ $\quad$ $\frac{n}{5} \leq 6$

$n > 25$ $\quad$ $n \leq 30$

$25 < n \leq 30$

$n = 26$

5

2. Brand 1 = B

Brand 2 = C

Extended warranty = E

$P(B) = 0.7$

$P(C) = 0.3$

$P(E|B) = 0.2$

$P(E|C) = 0.4$

(a) $P(B) = 0.7$

(b) $P(C) = 0.3$

(c) $P(E|B) = 0.2$

6

(d) $P(B \cap E) = P(E|B) \times P(B)$

$= 0.2 \times 0.7$

$= 0.14$

4

(e) $P(C \cap E) = P(E|C) \times P(C)$

$= 0.4 \times 0.3$

$= 0.12$

5

(f) $P(E) = P(B \cap E) + P(C \cap E)$

$= 0.14 + 0.12$

$= 0.26$

5

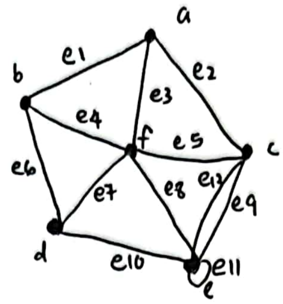
(g) $P(B|E) = \frac{P(B \cap E)}{P(E)}$

$= \frac{0.14}{0.26}$

$= 0.54$

5

3.



(a) Vertices - point where two or more edge meet

$V = \{a, b, c, d, e, f, g\}$

(b) Edges - line conneted between two vertices

$E = \{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9, e_{10}, e_{11}, e_{12}\}$

(c) Adjacent Vertices - vertices that incident by an edge

a and b are adjacent vertices

(d) Incident Edge - edge has connected to any vertices

e_1, e_2, e_3 are incident on a

(e) Isolated Vertex - no incident with any edge

g is isolated vertex

(f) Loop - an edge incident on a single vertex

e_{11} is a loop

(g) Parallel Edge - two or more distinct edge with the same set of endpoints

e_9 and e_{12} are parallel

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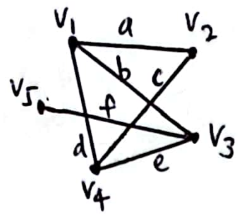
4.



Vertex	v_1	v_2	v_3	v_4	v_5
Degree	3	2	3	3	1

5 i. Incidence Matrix:

$$
\begin{array}{c c}
 & \begin{array}{cccccccccc} a & b & c & d & e & f & g & h & i & k \end{array} \\
\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array} &
\begin{bmatrix}
1 & 2 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1
\end{bmatrix}
\end{array}
$$

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ii. Adjacency Matrix:

$$
\begin{array}{c c}
 & \begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \\
\begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{array} &
\begin{bmatrix}
1 & 0 & 2 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 \\
2 & 0 & 0 & 1 & 1 & 1 \\
1 & 1 & 1 & 0 & 0 & 1 \\
0 & 0 & 1 & 0 & 0 & 1 \\
0 & 0 & 1 & 1 & 1 & 0
\end{bmatrix}
\end{array}
$$

6. $d(A)=2$ $d(D)=4$ $d(1)=3$ $d(4)=3$

$d(B)=4$ $d(E)=2$ $d(2)=2$ $d(5)=4$

$d(C)=3$ $d(F)=3$ $d(3)=4$ $d(6)=2$

- Both Graph Y and Z have 6 vertices and 9 edges.
- Both Graph Y and Z are connected graph and simple graph.
- Both Graph Y and Z have 2 vertices with 4 degree, 2 vertices with 3 degree, and 2 vertices with 2 degree.
- Let:

  $f(A)=6$ $f(C)=4$ $f(E)=2$

  $f(B)=5$ $f(D)=3$ $f(F)=1$

$\therefore$ Graph Y and Z are isomorphic. (Proven)

- Adjacency Matrix of Graph Y:

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

- Adjacency Matrix of Graph Z:

$$\begin{array}{c} \\ 6 \\ 5 \\ 4 \\ 3 \\ 2 \\ 1 \end{array}\begin{array}{c} \begin{array}{cccccc} 6 & 5 & 4 & 3 & 2 & 1 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

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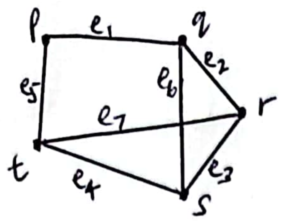
7.



i. Possible paths: $(p, e_1, q, e_2, r, e_3, s, e_4, t)$
: $(p, e_1, q, e_2, r, e_7, t)$
: $(p, e_1, q, e_6, s, e_4, t)$ 5
: $(p, e_1, q, e_6, s, e_3, r, e_7, t)$
: (p, e_5, t)

ii. Possible trails: $(p, e_1, q, e_2, r, e_3, s, e_4, t)$
: $(p, e_1, q, e_2, r, e_7, t)$
: $(p, e_1, q, e_6, s, e_4, t)$ 5
: $(p, e_1, q, e_6, s, e_3, r, e_7, t)$
: (p, e_5, t)

iii. Shortest path: (p, e_5, t) 2
Longest path: $(p, e_1, q, e_2, r, e_3, s, e_4, t)$
: $(p, e_1, q, e_6, s, e_3, r, e_7, t)$

iv. Shortest path: (p, e_5, t)
: $(p, e_1, q, e_2, r, e_3, s, e_4, t)$ 2
: $(p, e_1, q, e_6, s, e_3, r, e_7, t)$