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Discrete Structure Assignment 3

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Question 1

(a) Pigeon : Students

Pigeonhole : Scores 0 to 100

$k = 2$.

$$\left\lceil \frac{n}{101} \right\rceil = 2$$

$$n = 102.$$

(b) Pigeon : Students.

Pigeonhole : $\{A, B, C, D, F\}$.

$$\left\lceil \frac{n}{5} \right\rceil = 6.$$

$$n = 5 \times (6-1) + 1$$

$$n = 26$$

Question 2.

(a) $P(A) = \frac{70}{70+30} = 0.7$

(b) $P(B) = \frac{30}{70+30} = 0.3$

(c) $P(W|A) = 0.2$

(d) $P(W|A) = \frac{P(A \cap W)}{P(A)}$

$P(A \cap W) = P(W|A)\,P(A)$

$= 0.2\,(0.7)$

$P(A \cap W) = 0.14$

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(e) $P(W|B) = \frac{P(B \cap W)}{P(B)}$

$P(B \cap W) = P(W|B)\,P(B)$

$= 0.4\,(0.3)$

$= 0.12.$

(f) $P(W) = P(W|A)\,P(A) + P(W|B)\,P(B)$

$= 0.2\,(0.7) + 0.4\,(0.3)$

$P(W) = 0.26$

(g) $P(A|W) = \frac{P(W|A)\,P(A)}{P(W)}$

$= \frac{0.2\,(0.7)}{0.26}$

$P(A|W) = 0.5386.$

Question 3.

(a) Vertices : points in a graph.

(b) Edges : connecting line between vertices.

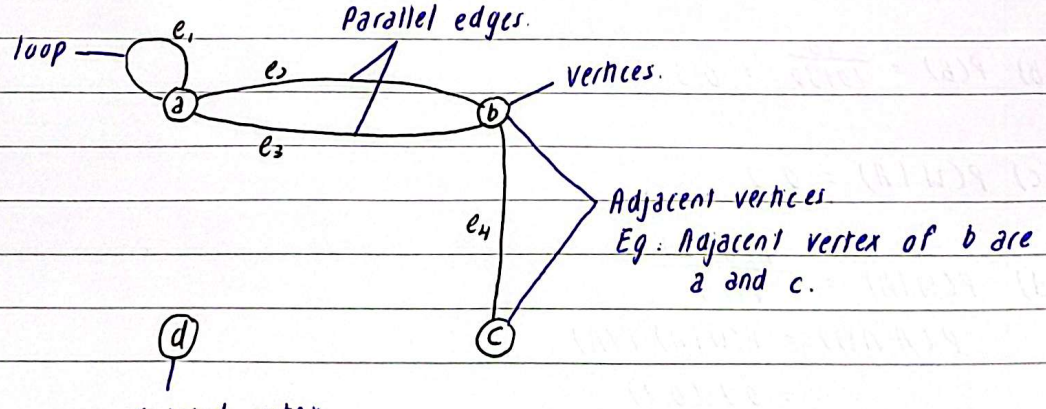
(c) Adjacent vertices : vertices that are connected to the same edge.

(d) Incident edges : edges that are incident to a vertex.

(e) Isolated vertex : vertex that has no connection at all

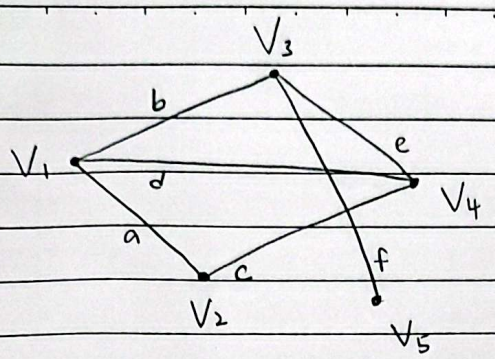
(f) Loop : edge that go out and end at the same vertex.

(g) Parallel edges : two or more edges that are connected to the same two vertices.



e_2, e_3, e_4 are incident with b

4.



$d(V_1) = 3$

$d(V_2) = 2$

$d(V_3) = 3$

$d(V_4) = 3$

$d(V_5) = 1$

5. i) incident matrix

	a	b	c	d	e	f	g	h	i	k
V_1	1	2	1	1	0	0	0	0	0	0
V_2	0	0	0	0	1	0	0	0	0	0
V_3	1	0	1	0	0	1	1	1	0	0
V_4	0	0	0	1	1	1	0	0	1	0
V_5	0	0	0	0	0	0	0	1	0	1
V_6	0	0	0	0	0	0	1	0	1	1

ii) adjacent matrix

	V_1	V_2	V_3	V_4	V_5	V_6
V_1	1	0	2	1	0	0
V_2	0	0	0	1	0	0
V_3	2	0	0	1	1	1
V_4	1	1	1	0	0	1
V_5	0	0	1	0	0	1
V_6	0	0	1	1	1	0

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Question 6.

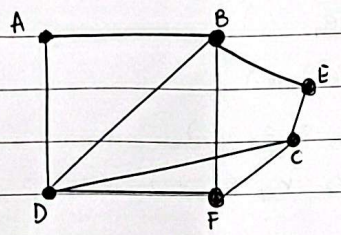
Both graphs have 6 vertices and 9 edges.

Both graphs have : 2 vertices = 4 degrees.

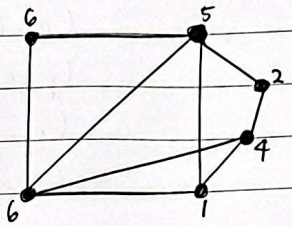
2 vertices = 3 degrees.

2 vertices = 2 degrees.

Define : $f(A) = 6$, $f(B) = 5$, $f(C) = 4$, $f(D) = 3$, $f(E) = 2$, $f(F) = 1$



Graph Y



Graph Z

A_Y rows and column are labeled : A, B, C, D, E, F

A_Z rows and column are labeled : 6, 5, 4, 3, 2, 1

$A_Y =$

	A	B	C	D	E	F
A	0	1	0	1	0	0
B	1	0	0	1	1	1
C	0	0	0	1	1	1
D	1	1	1	0	0	1
E	0	1	1	0	0	0
F	0	1	1	1	0	0

$A_Z =$

	6	5	4	3	2	1
6	0	1	0	1	0	0
5	1	0	0	1	1	1
4	0	0	0	1	1	1
3	1	1	1	0	0	1
2	0	1	1	0	0	0
1	0	1	1	1	0	0

$\therefore$ Since A_Y and A_Z are the same,

thus Graph Y and Z are isomorphic.

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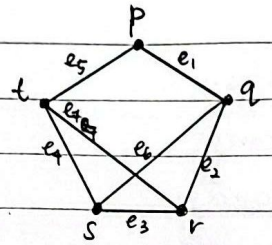
Question 7

Graph :



i) Path from p to t : (p, e5, t)
(p, e1, q, e6, s, e4, t)
(p, e1, q, e2, r, e7, t)
(p, e1, q, e2, r, e3, s, e4, t)
(p, e1, q, e6, s, e3, r, e7, t)

ii) Trail from p to t: (p, e5, t)
(p, e1, q, e6, s, e4, t)
(p, e1, q, e2, r, e7, t)
(p, e1, q, e2, r, e3, s, e4, t)
(p, e1, q, e6, s, e3, r, e7, t)
(p, e5, t, e4, s, e3, r, e7, t)
(p, e5, t, e7, r, e3, s, e4, t)
(p, e5, t, e4, s, e6, q, e2, r, e7, t)
(p, e5, t, e7, r, e2, q, e6, s, e4, t)

iii) Shortest path : (p, e5, t)
longest path : (p, e1, q, e2, r, e3, s, e4, t) and (p, e1, q, e6, s, e3, r, e7, t)

iv) Shortest trail : (p, e5, t)
Longest trail : (p, e5, t, e4, s, e6, q, e2, r, e7, t) and
(p, e5, t, e7, r, e2, q, e6, s, e4, t)