Subject : SECI1013 Discrete Structure

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Q1.

a.

Let the exam points $0 \sim 100$ be the pigeonholes, k and the students in a class be pigeons, n.

At least 2 students received the same score, $m = 2$

$$m = \lceil n/k \rceil \qquad k = 100 + 1 = 101 \text{ distinct points}$$

$$2 = \lceil n/k \rceil$$

$$n = k(m-1) + 1$$

$$n = 101(2-1) + 1$$

$$n = 102 \text{ students}$$

The minimum number of students is 102.

b.

Let the number of students be the pigeon, n and the five grades A, B, C, D, E, F as pigeonholes. k

$n = ?$, $k = 5$, $m = 6$

$$\frac{n}{m} \geq k$$

for minimum number of n with $\frac{n}{m} > k - 1$

$$n = k(m-1) + 1$$

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

$= 26$ students in discrete structure class

Q3.

a. Vertices : Points or dots in a graph.

b. Edges : Lines or segments that connect vertices.

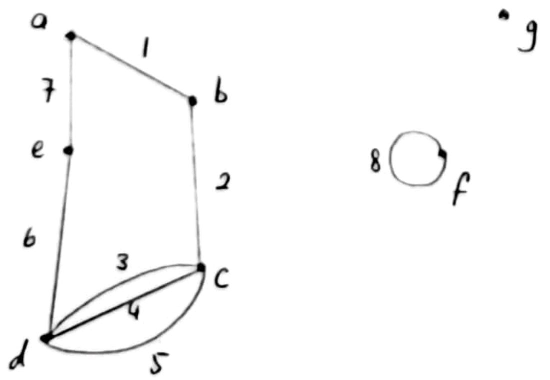
c. Adjacent Vertices : Either a point with edges that loops to itself, or any two points that are connected with each other by an edge

d. Incident edge : The characteristics of all edges where the edges are drawn from one of the two connected vertices or endpoints. An incident edge is the edge that has vertices on its ends.

e. Isolated vertex : A point / node where it does not have any edges

f. Loop : An edge that connect a vertex to itself.

g. Parallel Edges : Two or more unique edges that links the same set of endpoints.



- Vertices = { a, b, c, d, e, f, g }
- Edges = { 1, 2, 3, 4, 5, 6, 7, 8 }
- a is a vertex adjacent to vertices e and b, b is adjacent to a and c and so on for connected vertices. f is adjacent to itself.

- g is an isolated vertex.
- Edge 8 is a loop where it maps vertex f to itself.

- Edges 1 and 7 are incident on a. Edge 1 is incident on b. Edge 7 is incident on e.

- Edges 3, 4 and 5 are parallel to each other, linking vertex c and vertex d.

Question 2.

Brand 1 = B1 Purchase Extended Warranty = EW
Brand 2 = B2

(a) $P(B1) = \frac{P(B1)}{P(B1)+P(B2)}$

$= \frac{0.70}{0.70+0.30}$

$= 0.70.$

(b) $P(B2) = \frac{P(B2)}{P(B1)+P(B2)}$

$= \frac{0.30}{0.70+0.30}$

$= 0.30$

(c) $P(EW \mid B1) = 0.20.$

(d) $P(EW \mid B1) = \frac{P(EW \cap B1)}{P(B1)}$

$0.20 = \frac{P(EW \cap B1)}{0.70}$

$P(EW \cap B1) = 0.20 \times 0.70$
$P(EW \cap B1) = 0.14$

(e) $P(EW \mid B2) = \frac{P(EW \cap B2)}{P(B2)}$

$0.40 = \frac{P(EW \cap B2)}{0.30}$

$P(EW \cap B2) = 0.40 \times 0.30$
$P(EW \cap B2) = 0.12$

(f) $P(EW) = P(EW \mid B1)P(B1) + P(EW \mid B2)P(B2)$
$= (0.20)(0.70) + (0.40)(0.30)$
$= 0.14 + 0.12$
$= 0.26$

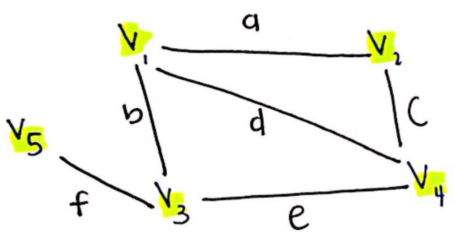
(g) $P(B1 \mid EW) = \frac{P(B1 \cap EW)}{P(EW)}$
$= \frac{0.14}{0.26}$
$= 0.5384615385$
$= 0.5385$

Q4

$G = \{E, V\}$

$V = \{V_1, V_2, V_3, V_4, V_5\}$

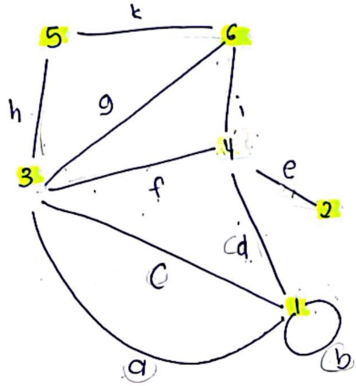
$E = \{a, b, c, d, e, f\}$



vertex	V_1	V_2	V_3	V_4	V_5
degree	3	2	3	3	1

Scanned with CamScanner

Q5



ii) Adjacency Matrix

$V = \{1, 2, 3, 4, 5, 6\}$

$E = \{a, b, c, d, e, f, g, h, i, k\}$

$$
\begin{array}{c}
 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6
\end{array}
\begin{array}{c}
\begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \end{array} \\
\begin{bmatrix}
1 & 0 & 11 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 & 1 & 1 \\
1 & 1 & 1 & 0 & 0 & 1 \\
0 & 0 & 11 & 0 & 0 & 1 \\
0 & 0 & 11 & 1 & 1 & 0
\end{bmatrix}
\end{array}
$$

i) Incident matrix.

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

Question 6

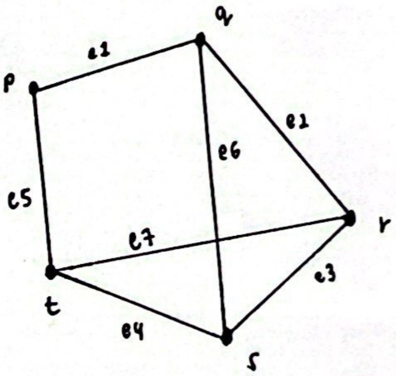
Yes, both graph Y and graph Z are isomorphic. Both graph have six vertices and nine edges. A and E have 2 degree while 2 and 6 have 2 degree too. C and F have 3 degree while 1 and 4 have 3 degree too. B and D have 4 degree while 3 and 5 have 4 degree

Define $f: Y \to Z$, where $Y = \{A, B, C, D, E, F\}$ and $Z = \{1, 2, 3, 4, 5, 6\}$

$$A_Y = \begin{array}{c} \\ A \\ B \\ C \\ D \\ E \\ F \end{array} \begin{array}{c} \begin{array}{cccccc} A & B & C & D & E & F \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \end{bmatrix} \end{array} \qquad A_Z = \begin{array}{c} \\ 6 \\ 3 \\ 4 \\ 5 \\ 2 \\ 1 \end{array} \begin{array}{c} \begin{array}{cccccc} 6 & 3 & 4 & 5 & 2 & 1 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

Question 7

e1 = (p, q) ; e2 = (q, r) ; e3 = (r, s) ; e4 = (s, t) ; e5 = (t, p) ; e6 = (q, s) ; e7 = (r, t)



i) path 1: p, e1, q, e6, s, e4, t

path 2: p, e1, q, e2, r, e3, s, e4, t

path 3: p, e1, q, e2, r, e7, t

path 4: p, e5, t

path 5: p, e1, q, e6, s, e3, r, e7, t

ii) trail 1: p, e1, q, e6, s, e4, t

trail 2: p, e1, q, e2, r, e3, s, e4, t

trail 3: p, e1, q, e2, r, e7, t

trail 4: p, e1, q, e6, s, e3, r, e7, t

trail 5: p, e5, t

iii) shortest path: p, e5, t

longest path: p, e1, q, e2, r, e3, s, e4, t

iv) shortest path: p, e5, t

longest path: p, e1, q, e2, r, e3, s, e4, t