INSTRUCTIONS:

a. This assignment must be conducted in a group. Please clearly write the group members' names & matric numbers on the front page of the submission.

b. Solutions for each question must be readable and neatly written on plain A4 paper. Every step or calculation should be properly shown. Failure to do so will result in the rejection of the submission of the assignment.

c. This assignment consists of 7 questions (85 Marks), contributing 5% of overall course marks.

STRUCTURES:

1. Chapter 3 Part 3: Pigeonhole Problem [10 Marks]
2. Chapter 3 Part 4: Probability [25 Marks]
3. Chapter 4 Part 1: Graph Theory (until Path and Cycle) [50 Marks]

(handwritten): a) n, region? m, region hole = 101   k = 2 $k = \left[\dfrac{n}{m}\right]$

Question 1   **[10 marks]**

a. How many students in a class to guarantee that at least two students received the same score on the final exam. If the exam is graded on a scale from 0 to 100 points.   (5 marks)

b. what is the minimum number of students required in a Structure Discrete class so that at least six students will receive the same letter grade (A,B,C,D, or F)   (5 marks)

(handwritten): a. $2 = \dfrac{n}{101}$ n = 202   b. n=? , k=6 , m=5 $6 = \dfrac{n}{5}$ n = 30

Question 2   **[25 marks]**

The following table gives information on Mobile phone sold by a certain store:

	~~Percentage~~ of Customers Purchasing	Of Those Who Purchase, ~~Percentage~~ Who Purchase Extended Warranty
Brand 1	70	20
Brand 2	30	40

A purchaser is randomly selected from among all those bought a mobile phone from the store.

Determine the probability that :

a. customer purchased Brand 1.   (2 marks)

(handwritten): a) A = brand 1   P(A) = 0.7   b) B = brand 2   P(B) = 0.3

c) w - extended warranty
$P(w|A) = 0.2$

d) $P(A \cap w)$
$P(w|A) = \frac{P(A \cap w)}{P(A)}$
$0.2 = \frac{P(A \cap w)}{0.7}$

$P(A \cap w) = 0.14$

g) $P(A|w) = \frac{P(w|A) P(A)}{P(w)}$
$= \frac{0.2 \times 0.7}{0.26} = 0.54$

b. customer purchased Brand 2 (2 marks)
c. customer purchase extended warranty given that purchase brand 1. (2 marks)
d. customer who bought brand 1 ~~and~~ purchased extended warranty. (4 marks)
e. customer purchased brand 2 ~~and~~ extended warranty purchased. (5 marks)
f. ~~...~~ purchased. (5 marks)
g. purchased ~~...~~ given that also bou... ...ranty (5 marks)

e) $P(w|B) = 0.4$

$P(w|B) = \frac{P(w \cap B)}{P(B)}$
$0.4 = \frac{P(w \cap B)}{0.3}$

$P(w \cap B) = 0.12$

f) $P(w) = P(w|A) P(A) + P(w|B) P(B)$
$= 0.2 \times 0.7 + 0.3 \times 0.4$
$= 0.26$

Question 3

Explain the given keyword using your own word and represent your understanding by drawing the graph.

a. Vertices – point in a graph
b. Edges – connect two vertices with each other
c. Adjacent Vertices – two vertices that are connected by an edge
d. Incident Edge – when a vertex is an endpoint to an edge
e. Isolated Vertex – a vertex that is not incident with any edge
f. Loop – an edge with just one endpoint
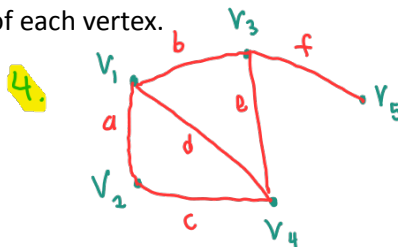g. Parallel Edges – two or more distinct edge with the same set of endpoints.
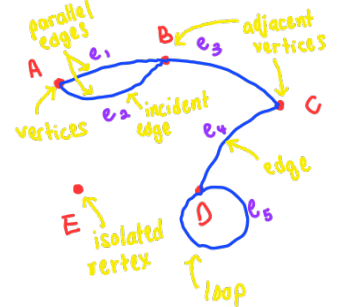
(7 Marks)

Question 4

Let G = {V, E} be a graph. An undirected graph having V ={v1, v2, v3, v4, v5} and E = {a, b, c, d, e, f}.
Where $a = (v1,v2)$, $b = (v1,v3)$, $c = (v2,v4)$, $d = (v1,v4)$, $e = (v3,v4)$ and $f = (v3,v5)$.

Find the degree of each vertex. (5 Marks)
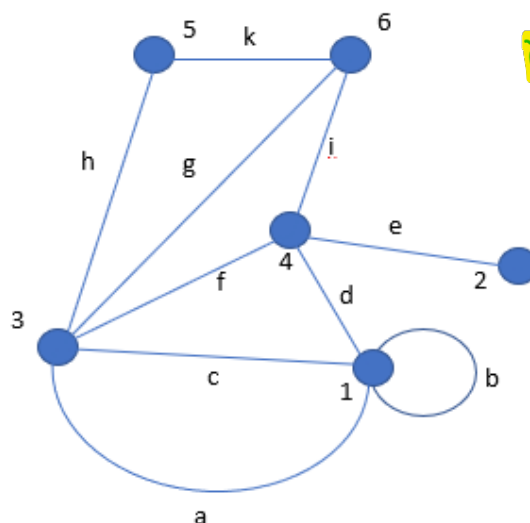
$d(v_1) = 3$
$d(v_2) = 2$
$d(v_3) = 3$
$d(v_4) = 3$
$d(v_5) = 1$

Question 5

loop count as 2

i) $M_{ij} = $

	a	b	c	d	e	f	g	h	i	k
1	1	2	1	1	0	0	0	0	0	0
2	0	0	0	0	1	0	0	0	0	0
3	1	0	1	0	0	1	1	1	0	0
4	0	0	0	1	1	1	0	0	1	0
5	0	0	0	0	0	0	0	1	0	1
6	0	0	0	0	0	0	1	0	1	1

ii) $M_{aij} = $

parallel count as 2

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

Given the graph shown above, Find:

    i.   Incidence Matrix   (6 Marks)

    ii.   Adjacency Matrix   (6 Marks)

$f(A) = 6 \qquad f(C) = 1 \qquad f(E) = 2$

$f(B) = 5 \qquad f(D) = 3 \qquad f(F) = 4$ ~~3~~

Question 6

$$Y_{maj} = \begin{array}{c c} & \begin{array}{c c c c c c} A & B & C & D & E & F \end{array} \\ \begin{array}{c} A \\ B \\ C \\ D \\ E \\ F \end{array} & \left[\begin{array}{c c c c c c} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 4 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array} \right] \end{array}$$
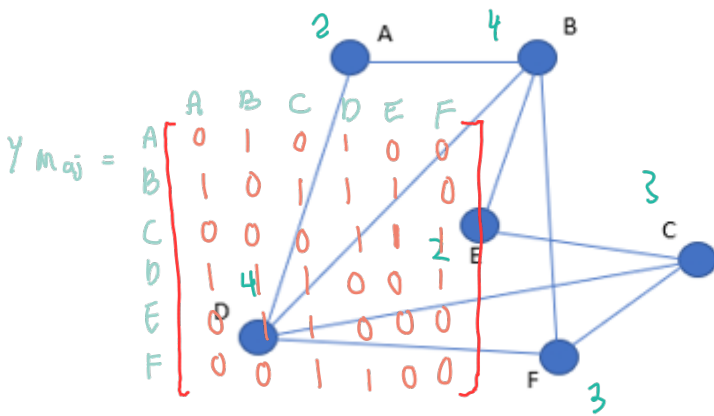
Graph Y
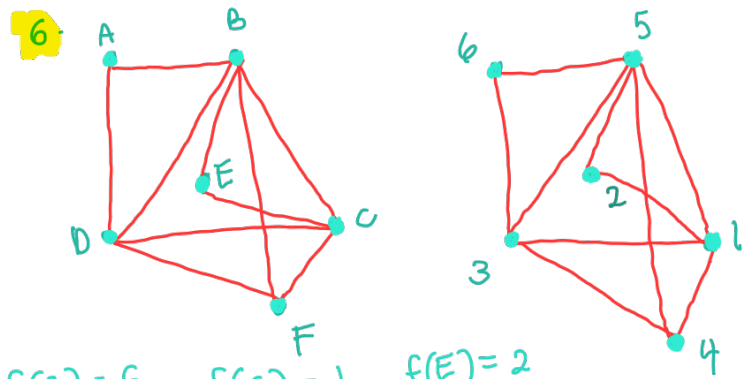
$$X_{maj} = \begin{array}{c c} & \begin{array}{c c c c c c} 6 & 5 & 1 & 3 & 2 & 4 \end{array} \\ \begin{array}{c} 6 \\ 5 \\ 1 \\ 3 \\ 2 \\ 4 \end{array} & \left[\begin{array}{c c c c c c} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{array} \right] \end{array}$$
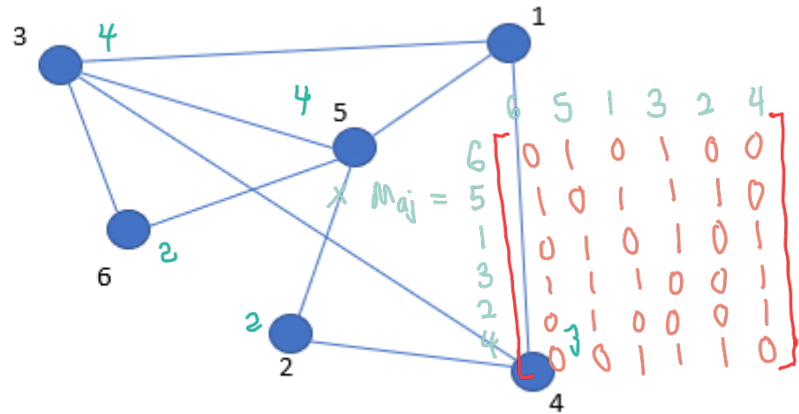
Graph Z

Determine whether Graph Y and Z above are isomorphic. If it is proven isomorphic, find their adjacency matrix.

(12 Marks)

6-

$Y: \quad n(v) = 6$

$\qquad n(E) = 9$

$\qquad n(\Sigma d) = 18$

$X = \quad n(v) = 6$

$\qquad n(E) = 9$

$\qquad n(\Sigma d) = 18$

∴ X & Y have same num of Vertices, edges & degree.

So, X & Y is isomorphic

Question 7

Consider an undirected graph with vertices V = {p, q, r, s, t} and edges E = {e1, e2, e3, e4, e5, e6, e7}. The edges are defined as follows:

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

Draw the graph and from the graph:

    i.   Find all possible paths from vertex p to vertex t. (5 Marks)

    ii.   Determine all possible trails from vertex p to vertex t. (5 Marks)

    iii.   Identify the shortest and longest path from vertex p to vertex t. (2.5 marks)

    iv.   Find the shortest and longest trail from vertex p to vertex t. (2.5 Marks)

(14 Marks)
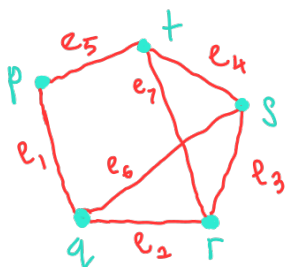
i) path from p → t

{p, e1, q, e2, r, e3, s, e4, t}

{p, e1, q, e6, s, e3, r, e7, t}

ii) trails from p → t

    Sama je la kan??

iii) & iv) tu mana ada berat TₐT