

BINGHAM UNIVERSITY
DEPARTMENT OF MATHEMATICS/STATISTICS
FACULTY OF SCIENCE AND TECHNOLOGY

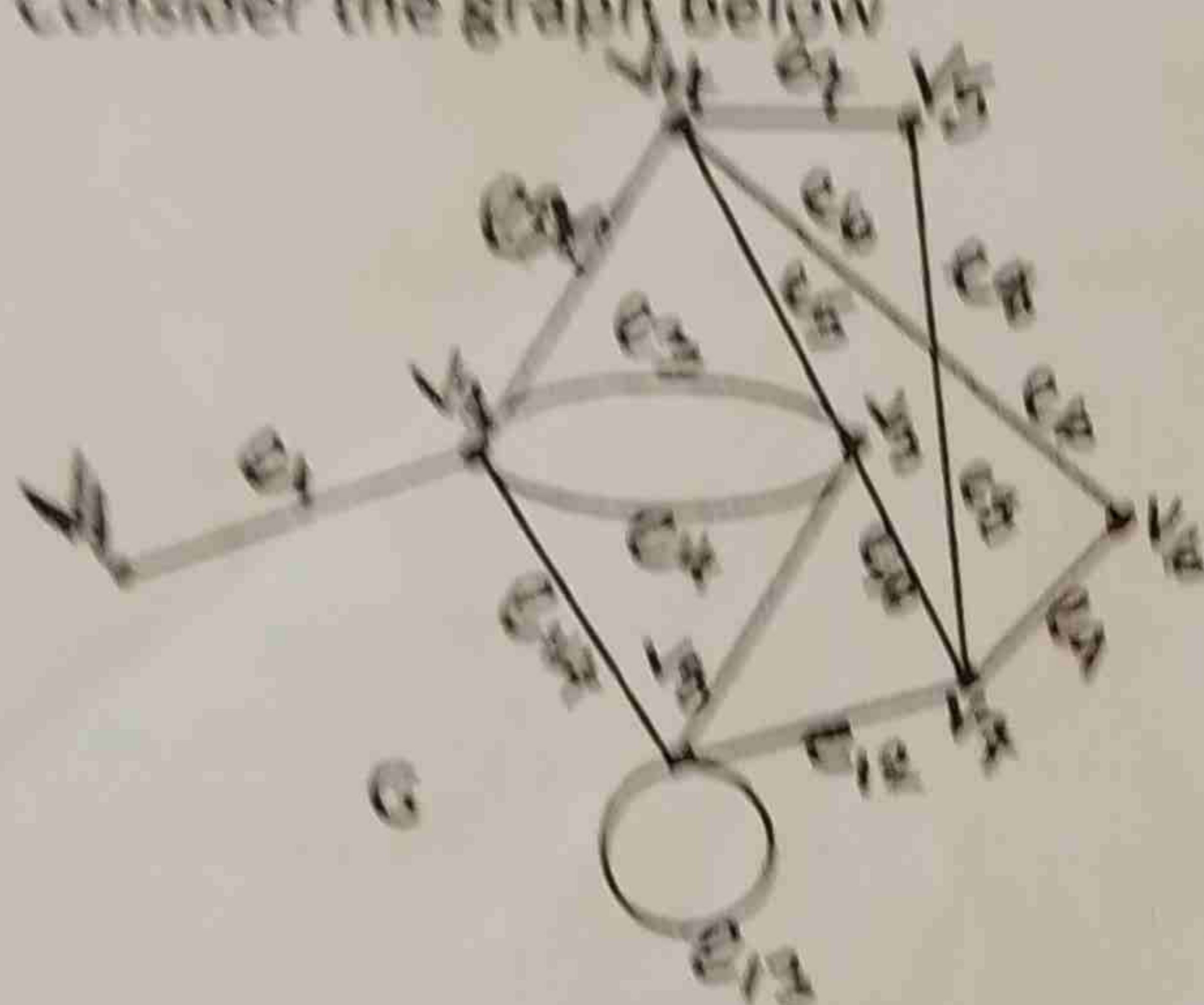
CMP 218: Discrete Structures

First Semester Examination, February 2020 Session: 2019/2020

Instruction: Answer any four questions: Time Allowed: 2hrs

1. (a) State the handshaking theorem
(b) Show that in undirected graph, the total number of odd degree vertices is even
(c) How many edges does 5-regular graph on 6 vertices has, draw the graph.

2. Consider the graph below



- (a) Find (i) $G - v_2$ (ii) $G - v_4$ (iii) $G - e_6$ (iv) $G - v_8$

- (b) Find the degree sequence of the graph G

- (c) What is a sub graph B of G.

3. Define the following graph theoretic terms and give one example of each.

- (i) Regular graph (ii) Complete graph (iii) Order of a graph (iv) Mult-graph (v) Simple graph

4. (a) Define the following;

- (i) a Lattice (ii) Bounded Lattice (iii) Complemented Lattice

- (b) Consider the partial ordering $(S_{36}, /)$, where S_{36} is divisors of 36 and the relation $/$ is division. Draw the Hasse diagram for S_{36} and show that $(S_{36}, /)$ is a Lattice

5. Simplify the following logic gate and draw a circuit corresponding to your simplified expression:

- (a) (i) $A = XY + XYZ + XY\bar{Z} + \bar{X}YZ$ (ii) $X = AB + AB(AC)$

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CMP 215: Discrete Structures

First Semester Examination, February 2019 Session: 2018/2019

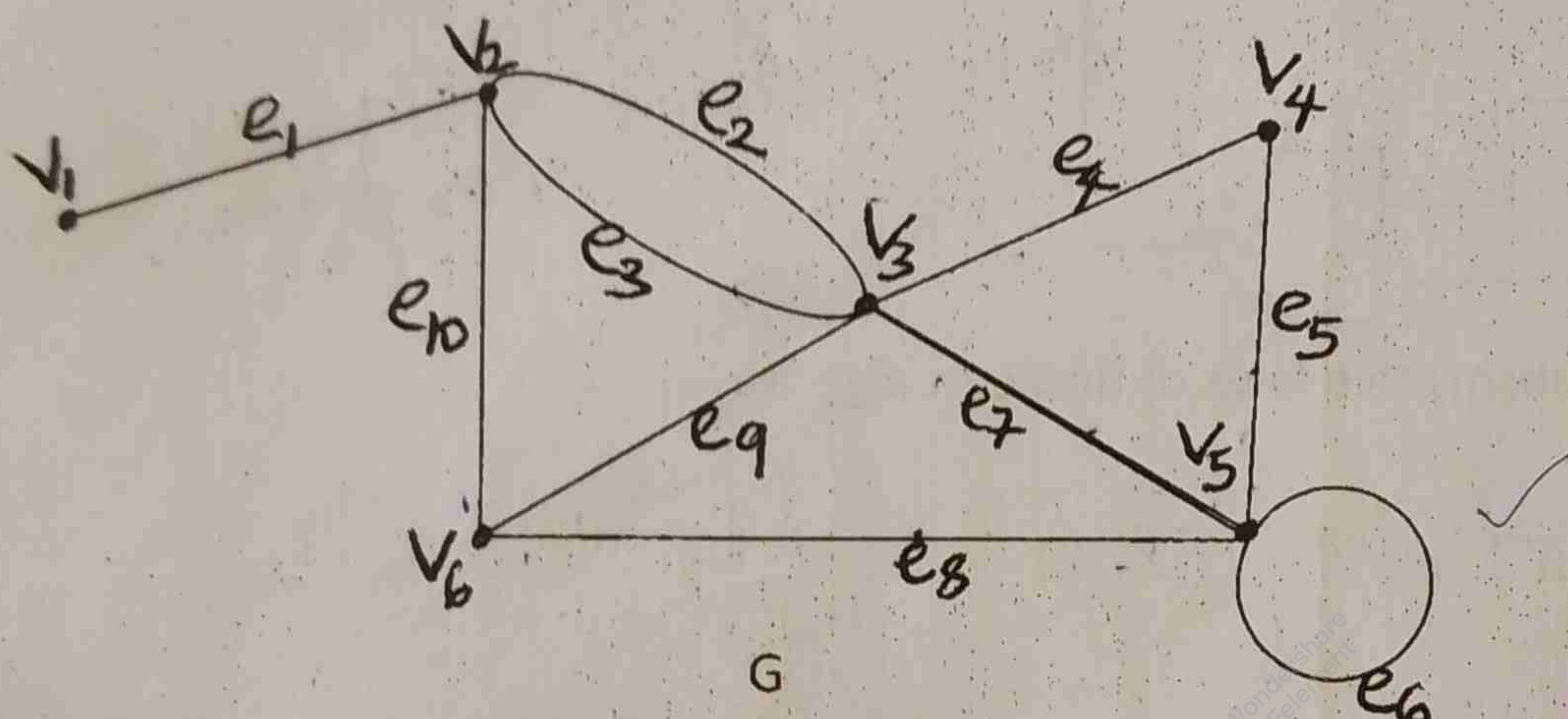
Instruction: Answer any four questions: Time Allowed: 2hrs

1. (a) State the handshaking theorem

(b) Proof that maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$

(c) How many edges does 6-regular graph on 8 vertices has, draw the graph

2. Consider the graph below



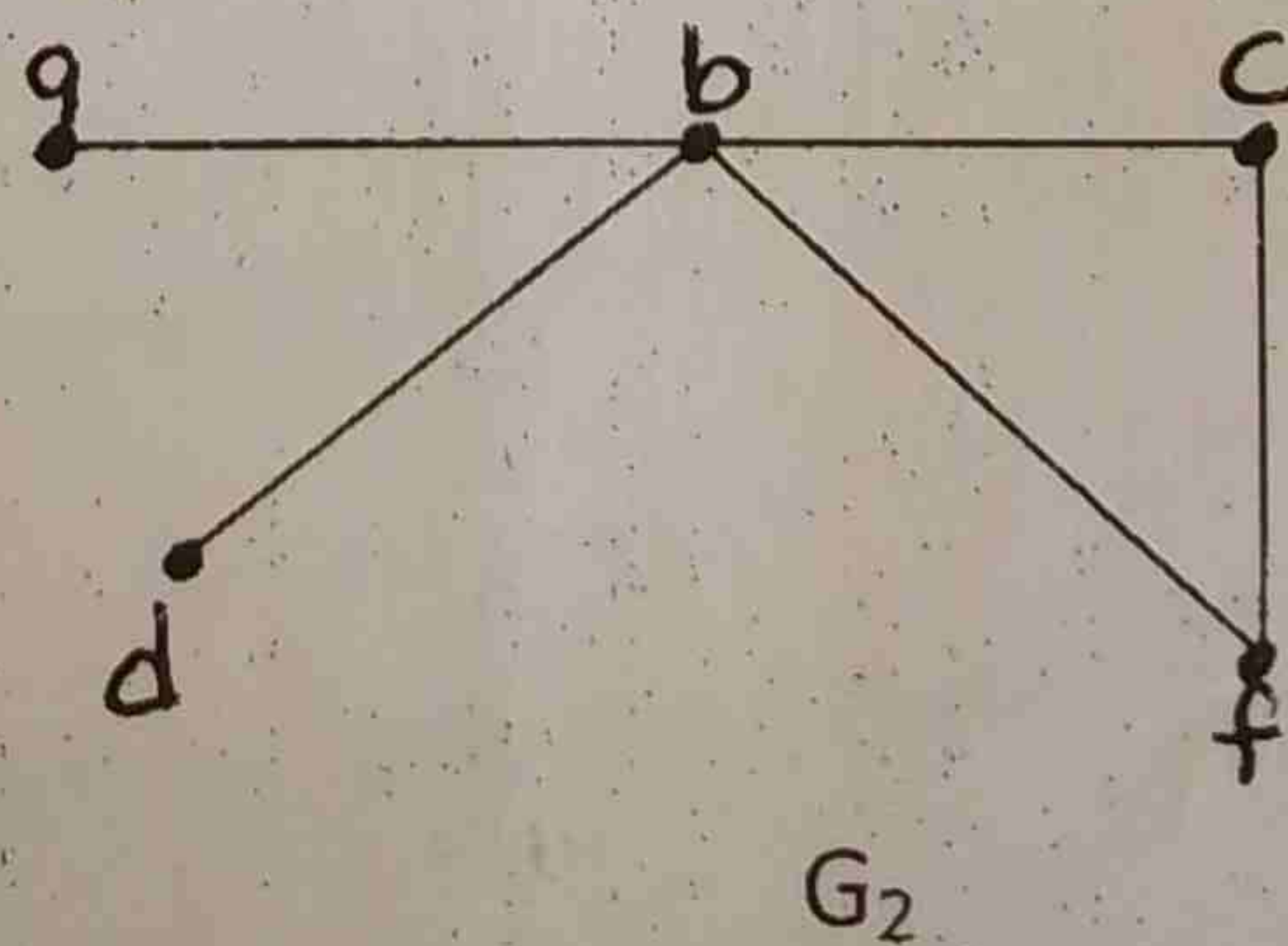
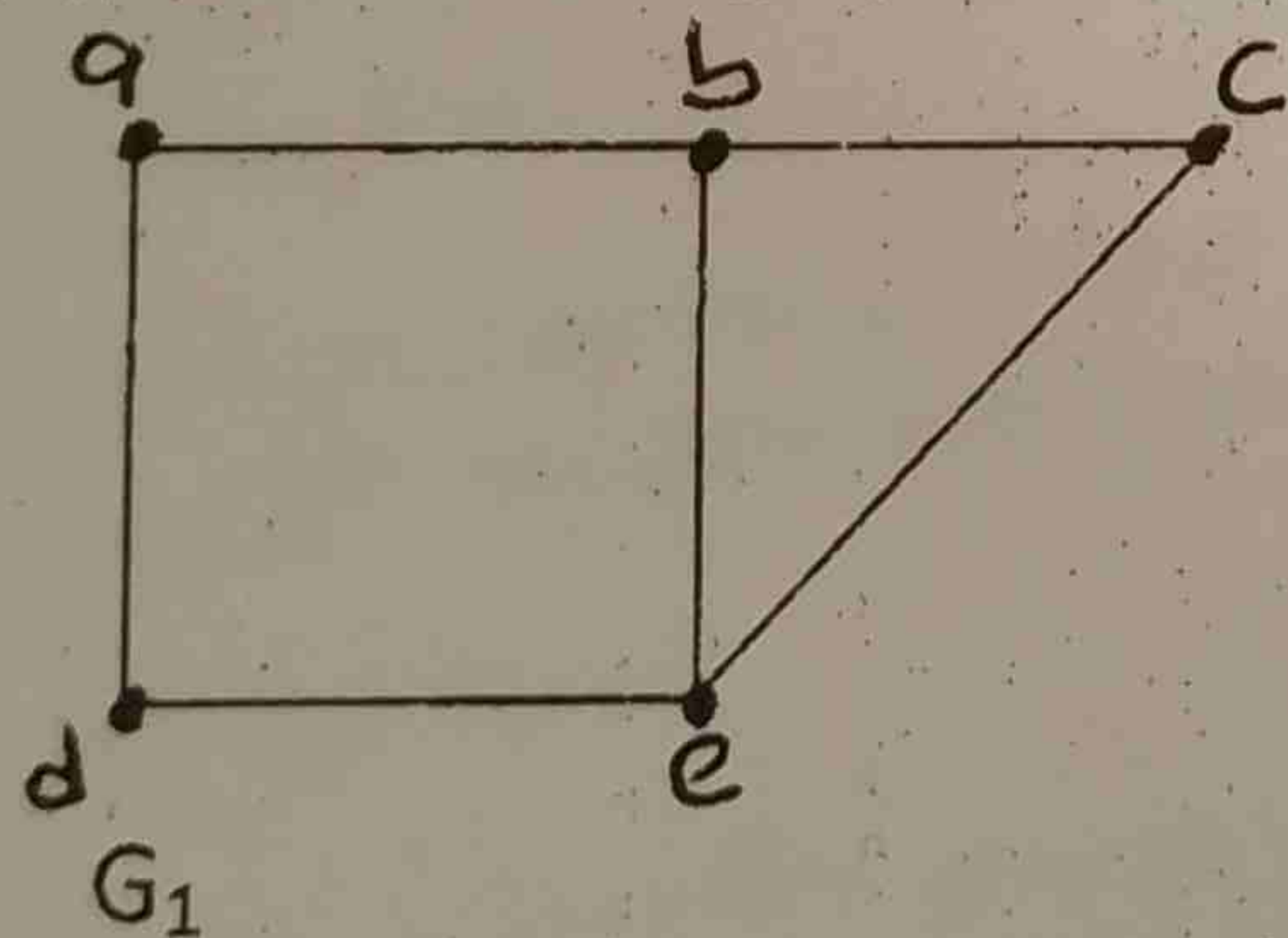
(a) Find (i) $G - v_5$ (ii) $G - v_3$ (iii) $G - e_5$ (iv) $G - e_2$

(b) Find the degree sequence of the graph G

3. (a) Define the following graph theoretic terms

(i) Null graph (ii) complete graph (iii) size of a graph (iv) a loop (v) degree of a vertex

(b) Consider the graph G_1 and G_2 below, find $G_1 \cup G_2$



4. (a) What is a Partial ordered set

(b) Show that (\mathbb{N}, \leq) is a partial ordered set, where \mathbb{N} is the set of natural numbers

(c) Given $A = \{-6, -3, 0, 1, 2\}$ and $\{1, 2, 3, 4\}$. Find $A \nabla B$

KARUNIA UNIVERSITY, KARU

DEPARTMENT OF MATHEMATICS/STATISTICS

FIRST SEMESTER EXAMINATION

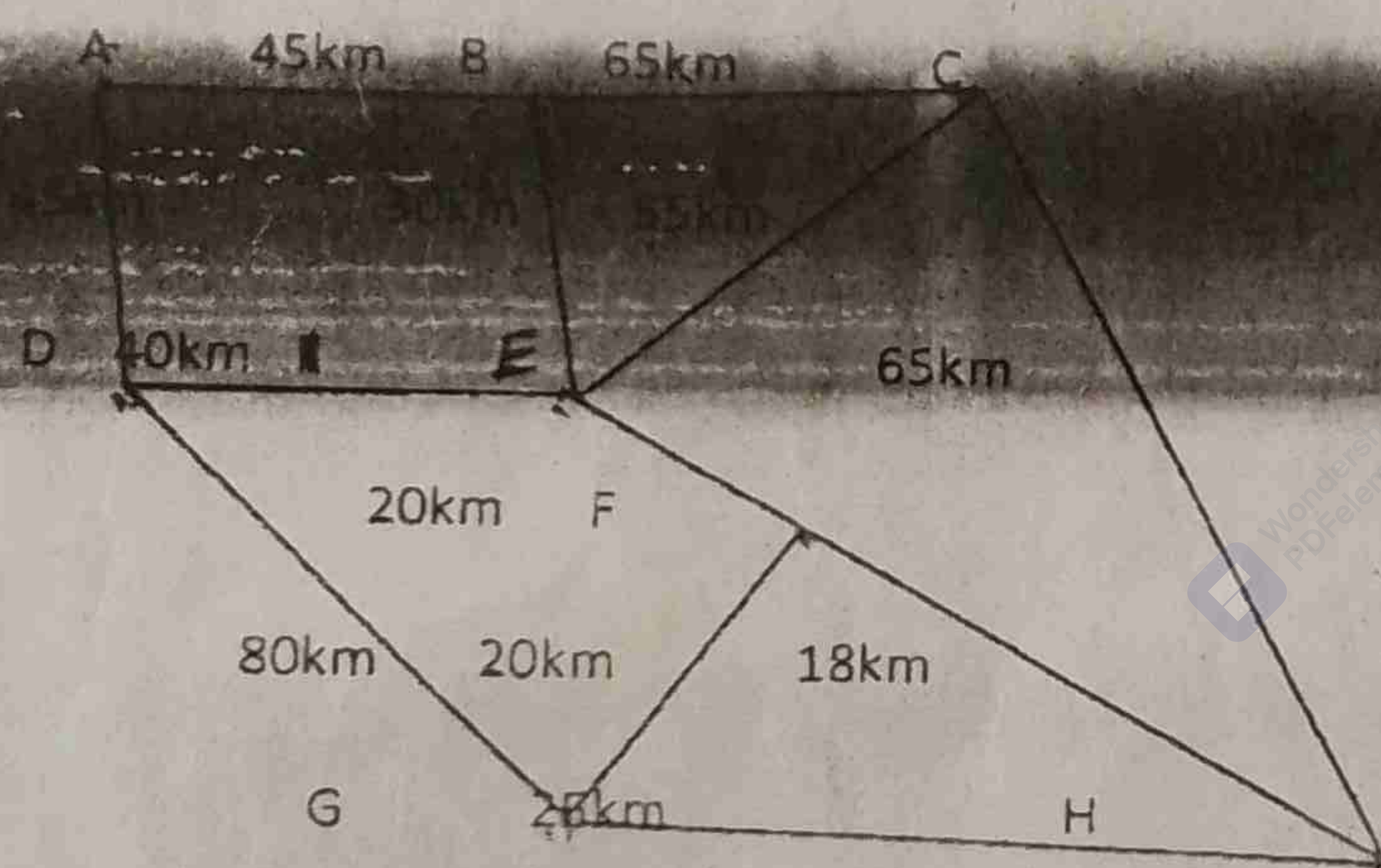
2016/2017 SESSION

COURSE: CMP 215 (DISCRETE STRUCTURES)

TIME: 2 HOURS

INSTRUCTION: ATTEMPT ANY FOUR (4) QUESTIONS ONLY

- Q1. (a) The minimum cost incurred by a Coca Cola Company is completely determined by the minimum distance covered in the distribution of its products between its depots as shown by the travelling salesman graph below. State all the possible routes and its total distances and advice the company on the routes to take in order to have the minimum cost if the initial take off and terminal point is A



- (b) How many vertices and edges do the following graphs have?

(i) K_n (ii) C_n (iii) W_n (iv) $K_{m,n}$ (v) Q_n

- Q2. (a) In a class of 25 students, 12 have taken Mathematics. 8 have taken Mathematics but not Biology. Find the number of students who have taken Mathematics and Biology and those who have taken Biology but not Mathematics using set algebra only.

- (b) Does there exist a 7-regular graph on 8 vertices? If so draw it and leave if otherwise.

- (c) Given the set $A = \{2, 3, 5\}$ and $B = \{2, 4, 6, 10\}$, find $A \oplus B$ and $A \Delta B$

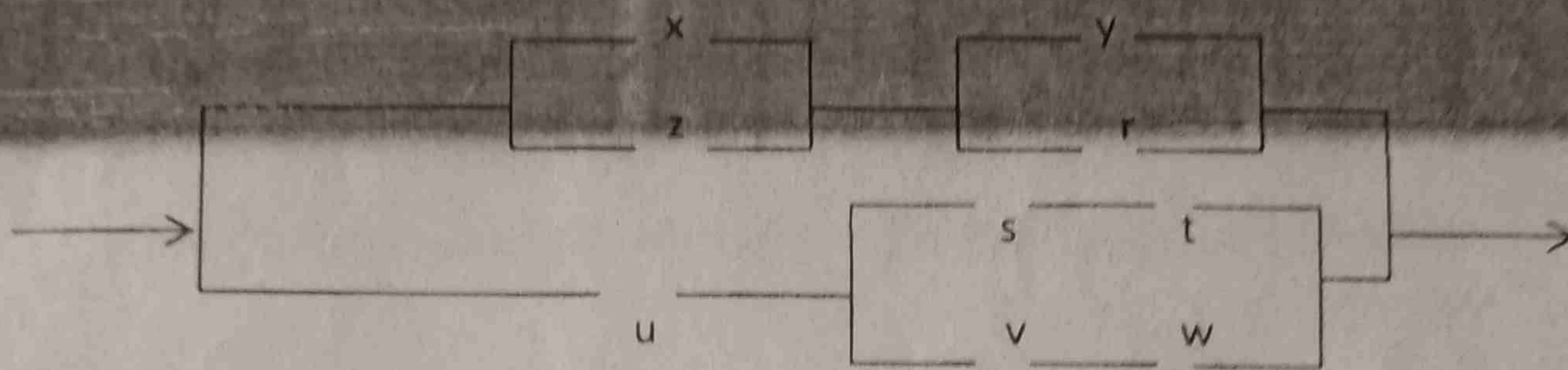
- (d) Give the formula for the cardinality of the union of three finite sets A, B and C

- (e) Distinguish between the sets ϕ , $\{\phi\}$, $\{0\}$, and 0.

- (f) Define the following graph theoretic terms:

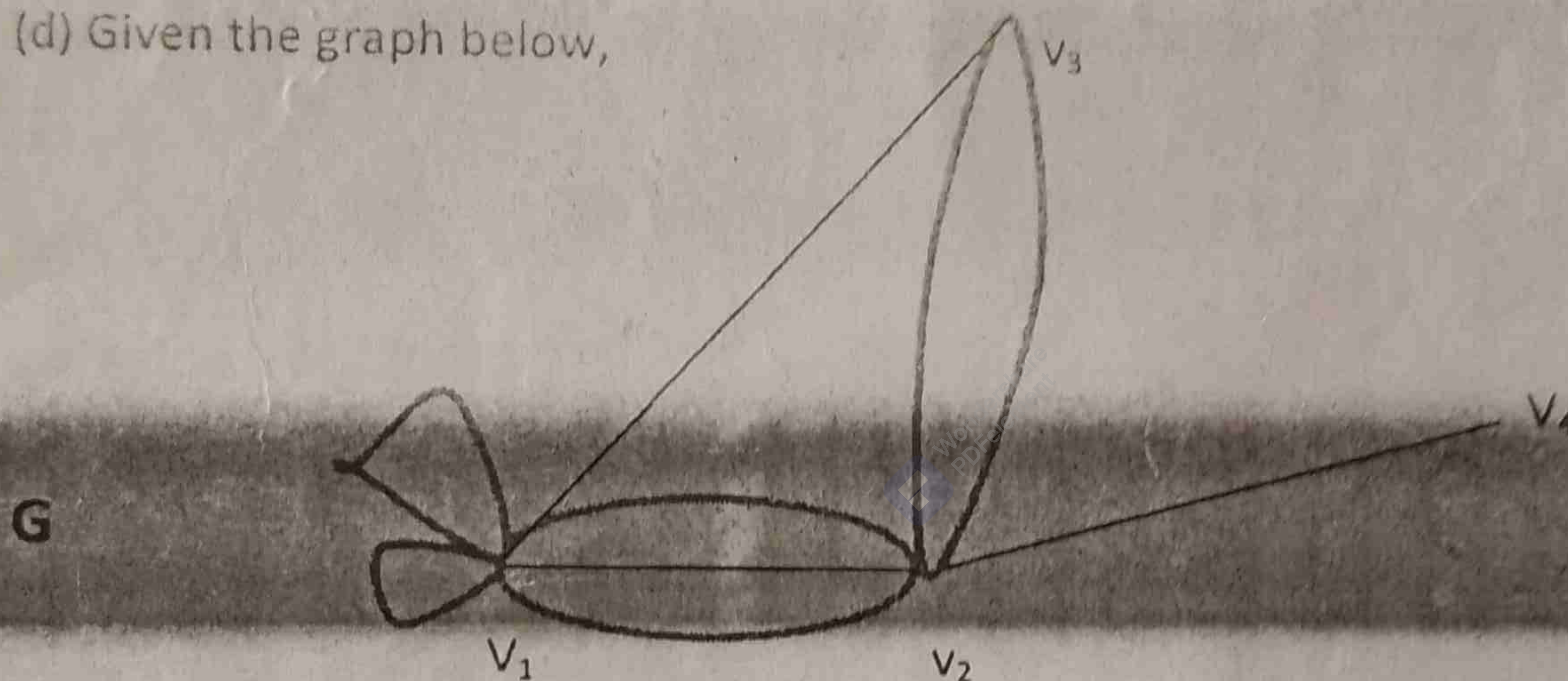
- (i) The order of a graph (ii) The size of a graph (iii) A graph (iv) A loop (v) A null graph

- Q3. (a) Draw the logic diagram to represent the Boolean expressions below
 (i) $(xy)' + (x'yz)'$ (ii) $(x' + y')' + xy'$
 (b) State without prove De-Morgan's theorems
 (c) Write the switching network below algebraically



- Q4. Given the set $A = \{2, 3, 4\}$ and $B = \{3, 4, 5\}$. Let the elements of each relation of R be as defined below and find the domain and range of R .

- (a) $a \in A$ is related to $b \in B$, that is, $a R b$ if and only if $a < b$
 (b) $a \in A$ is related to $b \in B$, that is, $a R b$ if a and b are both odd numbers.
 (c) Give the expression for the cardinality of the union of four finite sets A, B, C and D
 (d) Given the graph below,



Find (i) $G - v_1$ (ii) $G - v_2$ (iii) $G - v_3$

- Q5. (a) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$
 (b) Prove that in a non-directed graph, the total number of odd degree vertices is even
 (c) Draw the logic diagram to represent the Boolean expressions below
 (i) $(xy)' + (x'yz)'$ (ii) $(x' + y')' + x'y'$
 (d) Draw the switching network diagram represented by the Boolean expression

$$A(B + CD) + E(K + FGQ + LR) + (X + YZ)$$