



Roll No. _____

B.Tech. III-Sem UD Main Exam Dec - 2023
Computer Science Engineering
Subject: Discrete Mathematical Structures
Branch: CS/IT

Time: 3 Hours

Maximum Marks: 100

Instructions to candidates: -

PART A : Short answer questions (up to 25 words) 10 x 2 marks = 20 marks.
All ten questions are compulsory.

PART B : Analytical/Problem Solving questions (up to 100 words) 6 x 5 marks = 30 marks. *Candidates have to answer six questions out of eight.*

PART C : Descriptive/ Analytical/Problem solving questions 5 x 10 marks = 50 marks. *Candidates have to answer five questions out of seven.*

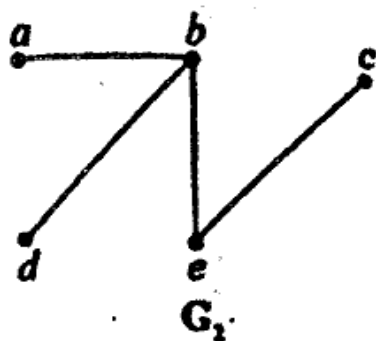
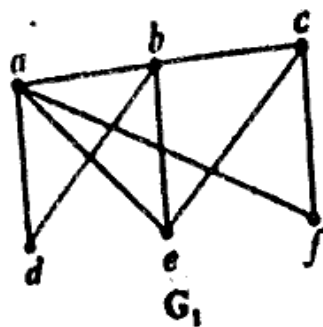
The following code(s) are required:

1. _____ 2. _____

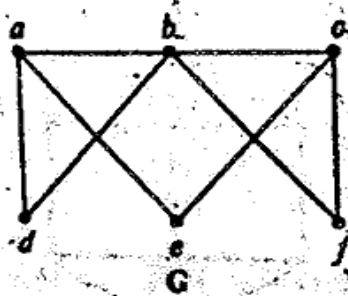
PART (A)

- Q:1) (a) Show that the relation $a \leq b$ on a set $A = \{1, 2, 3, 4\}$ is reflexive.
(b) Show that the relation on R defined by aRb if and only if $a < b$ is not reflexive.
- Q:2) What do you understand by Ring-sum of two graph?
- Q:3) What is Injective mapping?
- Q:4) Define Incidence matrix.
- Q:5) Differentiate between Universal relation and Identify relation.
- Q:6) How many kinds of functions are there? Name them.
- Q:7) What are the properties of subset?

Q:8) Find the difference of the following two graphs.



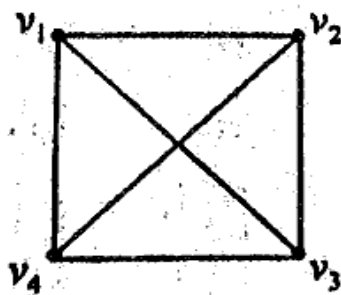
Q:9) Draw the diagram of the graph obtained by the fusion of the vertices c in the following graph.



Q:10) Obtain CNF of $p \wedge (p \rightarrow q)$.

PART (B)

Q:1) Find the number of paths of length 3 between two vertices of K_4 .



- Q:2) Briefly describe Kruskal's algorithm.
- Q:3) Using Warshall's algorithm, find the transitive closure of the relation $R = \{(a, a), (a, b), (a, d), (c, b), (c, c), (d, b), (d, c), (d, d)\}$ on $\{a, b, c, d\}$
- Q:4) Define Algebraic Structure and their properties.
- Q:5) Briefly describe Prim's algorithm.
- Q:6) Explain Semi Graph, Monoid Group and Abelian Group.

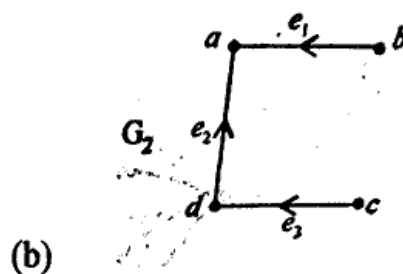
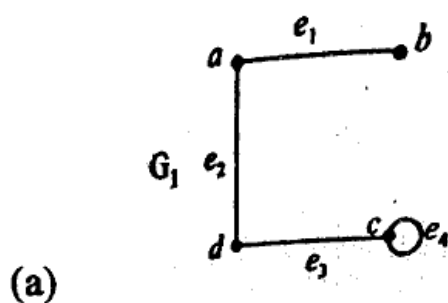
Draw the graph represented by the following incidence matrix:

(i)
$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}$$

(ii)
$$\begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 1 & 2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

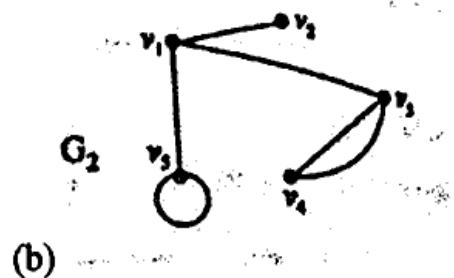
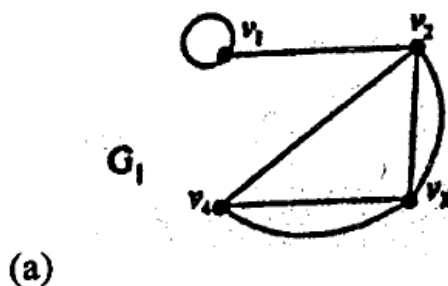
(iii)
$$\begin{matrix} & e_1 & e_2 & e_3 & e_4 \\ u_1 & 1 & 1 & 0 & 0 \\ u_2 & 0 & 0 & -1 & -1 \\ u_3 & -1 & 0 & 1 & 0 \\ u_4 & 0 & -1 & 0 & 1 \end{matrix}$$

Q:8) Find the incidence matrices for the following graph:



PART (C)

Q:1) Find the ^{adjacency} incidence matrices of the following:



Q:2) Explain Pigeonhole principle.

Q:3) Name types of sets. Explain each type of set.

Q:4) Explain Warshall's Algorithm.

Q:5) Obtain the PDNF of the proposition $\sim(p \vee q) \leftrightarrow (p \wedge q)$.

Q:6) Differentiate between Eulerian and Hamiltonian Path and Circuit with diagram.

Q:7) Find the DNF of $(\sim p \rightarrow r) \wedge (p \leftrightarrow q)$ using truth table.