



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:III
Class:SY	Program:B.Tech
Branch Code:INT	Pattern:2022
Name of Course:Discrete Mathematics	Course Code:INT222001
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains Three page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

- 1a) Let A and B be the multisets [a, a, b, b, c, f] and [a, a, b, b, d, d] respectively. (6) CO1
- (a) $A \cup B$ (b) $A - B$ (c) $B - A$

Question No. 2 Attempt following Question

- 2a) Define the following terms with suitable example (6) CO2
- (i) Factor of graph
- (ii) Weighted Graph
- (iii) Graph Coloring

Question No. 3 Attempt following Question

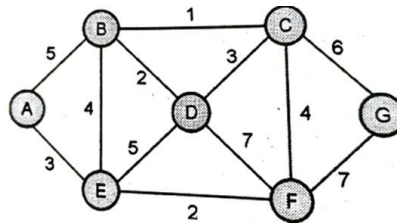
- 3a) Define the following Term (5) CO3
- (i) Binary Tree
- (ii) Level and Height of a Tree

OR

- 3b) Define the following Term (5) CO3
- (i) Properties of trees
- (ii) Optimal Binary Tree

3c) Determine the minimum spanning tree using Prim's algorithm for the following graph

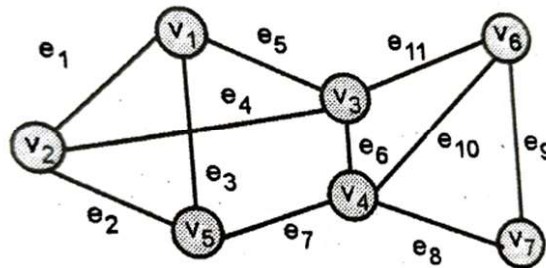
(5) CO3



OR

3d) Find the fundamental system of cut set for the graph G shown below with respect to the spanning Tree T.

(5) CO3



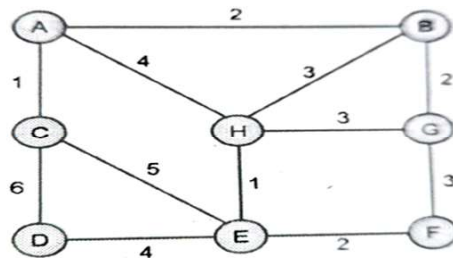
3e) For the following sets of weight, construct an optimal binary prefix code for each weight in the set, give the corresponding code word: 8, 9, 10, 11, 13, 15, 22

(6) CO3

OR

3f) Give the stepwise construction of minimum spanning tree using Prim's algorithm for the following graph. Obtain the total cost of minimum spanning tree.

(6) CO3



Question No. 4 Attempt following Question

4a) Explain the Representation of relations with example.

(5) CO4

OR

4b) Explain the properties of relation with suitable example.

(5) CO4

4c) Draw the graph and equivalent Hasse diagram for divisibility on the set :

(5) CO4

{1, 2, 3, 6, 12, 24, 36, 48}

OR

4d) Define the closure of Relation. Explain the following closure properties write example.

(5) CO4

(i) Reflexive Closure

(ii) Transitive Closure

- 4e) Find the transitive closure of R by Warshall's algorithm where $A = \{1, 2, 3, 4, 5, 6\}$ and $R = \{(x, y) \mid |x - y| = 2\}$ and draw its digraph (6) CO4

OR

- 4f) Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 18, 24\}$ be ordered by the relation X divides Y (Y divides by X). Show that the relation is a partial order and draw Hasse diagram. (6) CO4

Question No. 5 Attempt following Question

- 5a) Find gcd(102, 30) and write in the form $102x + 30y$ for $x, y \in \mathbb{Z}$ (5) CO5

OR

- 5b) Solve the following by using Chinese Remainder Theorem (5) CO5
$$X \equiv 7 \pmod{12345}, X \equiv 3 \pmod{11111}$$

- 5c) Define terms 1) Algebraic system 2) Semi-Group 3) Monoid 4) Group 5) Subgroup (5) CO5

OR

- 5d) Show that the set of all non-zero real numbers is a group with respect to multiplication. (5) CO5

- 5e) What is an abelian group? Show that $(\mathbb{Z}_6, +)$ is an Abelian Group. (6) CO5

OR

- 5f) Consider the group $(\mathbb{Z}, +)$. Prove that $(\mathbb{Z}, *)$ is an abelian group where $*$ is a binary operation defined by $a * b = a + b + 1$ for all $a, b \in \mathbb{Z}$. (6) CO5

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