K. K. Wagh Institute of Engineering Education & Research, Nashik

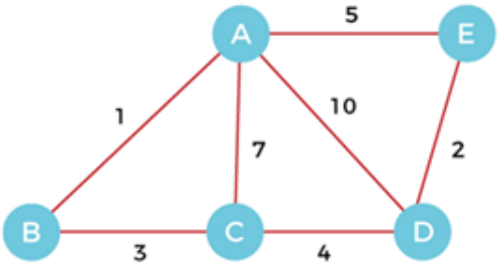
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:INT	Pattern:2023
Name of Course:Discrete Mathematics	Course Code:2308201
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 __3___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.

		Marks	**CO**
Question No. 1			
1a)	In a college, 120 students are enrolled in either Mathematics, Physics, or Chemistry. 50 students take Mathematics, 60 take Physics, and 40 take Chemistry. Additionally, 20 students take both Mathematics and Physics, 15 take both Physics and Chemistry, and 10 take both Mathematics and Chemistry. If 5 students are enrolled in all three courses, how many students are enrolled in exactly one course?	(6)	CO2
Question No. 2			
2a)	A simple graph contains 35 edges, four vertices of degree 5, five vertices of degree 4 and four vertices of degree 3. Find the number of vertices with degree 2	(6)	CO1
Question No. 3			
3a)	Construct the binary expression tree for the following expression: $((x + 3) \times (y - 2)) - ((a \times b) + (c / d))$ Then write the infix, prefix, and postfix expressions	(5)	CO3
	OR		
3b)	Write short notes on: (a) Height of a node (b) Depth of a tree (c) Level of a node	(5)	CO3
3c)	Find the minimal spanning tree of weighted graph using Kruskal's algorithm.	(5)	CO3

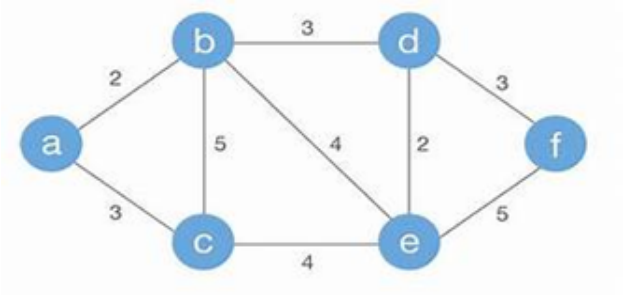


OR

3d) Consider a complete graph K_4 with vertices {A, B, C, D}. (5) CO3

(i) Find the number of spanning trees possible.
(ii) Draw all spanning trees for the given graph.

3e) Find the minimal spanning tree for the following weighted connected graph using Prim's Algorithm (6) CO3



OR

3f) Construct a Huffman code for the data. What is the minimum weighted path length? (6) CO3

Character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

Question No. 4

4a) Show that the set A = {1, 2, 3, 4} under the divisibility relation is not totally ordered. (5) CO4

OR

4b) Let S = {1, 2, 4, 5, 10, 20} and define the relation R on S by a divides b. Prove that (S, R) is a poset, and construct the Hasse diagram for the relation. (5) CO4

4c) let, A= {x, y, z}, Power set of A is P(A)= {ϕ, {x}, {y}, {z}, {x, y}, {x, z}, {y, z}, {x, y, z}} Show that (P(A), □) POSET is a lattice. (5) CO4

OR

4d) Let A = {p, q, r} and R = {(p, q), (q, q), (q, r)}. (5) CO4
Determine:
i) The reflexive closure of R

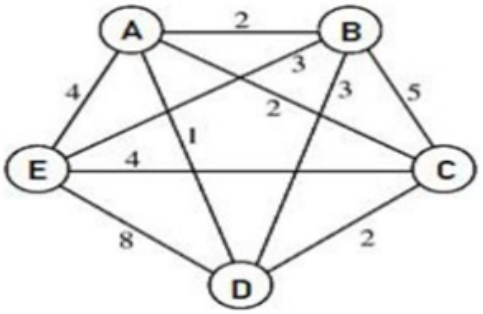
ii) The symmetric closure of R
iii) The transitive closure of R

4e) Let f: {1,2,3} → {a, b, c, d} be defined as (6) CO4

f (1) = a, f (2) = b, f (3) = c.
Find whether f is injective, surjective, or bijective

OR

4f) State Warshall's Algorithm for finding the transitive closure of a relation. Apply the algorithm step by step to the given graph. Show all intermediate matrices and obtain the final transitive closure matrix. (6) CO4



Question No. 5

5a) Determine the multiplicative inverse of 11 mod 26 using the Extended Euclidean Algorithm. (5) CO5

OR

5b) Find the GCD (252,105) using Euclid's Algorithm (5) CO5

5c) Prove Fermat's theorem hold true for p = 13 and a = 11. (5) CO5

OR

5d) Define Euler's Totient Function φ(n). Find φ (12), φ (30), and φ (100). (5) CO5

5e) Solve the following equations using CRT. (6) CO5

x ≡ 1 (mod 5)
x ≡ 3 (mod 7)
x ≡ 2 (mod 9)

OR

5f) Does Euler's theorem hold true for a = 10 and n = 11? (6) CO5

····· End of question paper·····