



Discrete Structure and Graph Theory
(173103 / 223103)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub questions from each unit.
5. Draw neat diagrams wherever necessary.
6. Figures to the right indicate full marks.
7. Assume suitable data wherever necessary.

UNIT - I

1. a) Explain Rule of sum, Rule of product, permutation and combination with suitable example of each. 8
- b) i) Explain universal quantifiers and existential quantifiers with example. 4
- ii) Among integers 1 to 500 how many are not divisible by 3, nor by 5. Also find how many are divisible by 5 but not by 7. 4
- c) i) Show that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ for all $n \geq 1$ 4
- ii) Consider the experiment of rolling two dice. Event A denotes that sum of numbers on top faces is even and event B denotes that there is 4 on at least one of top faces. Then find $P(A \cup B)$. 4

UNIT - II

2. a) Define binary relation. Explain properties of binary relation. Let $A = \{1, 2, 5, 6, 9\}$ and let $R = \{(a, b) | a \leq b\}$. Then prove that this relation is partial ordering relation. 8

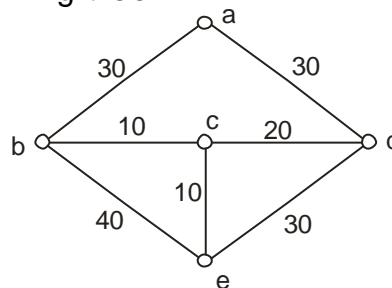
- b) Define function. Explain types of functions with example. Let $F:Z \rightarrow Z$ be defined as $f(x) = x^2 + 3x + 5$ and $g:Z \rightarrow Z$ be defined as $g(x) = x - 3$. Then find gof , fog ; gog , fof . 8
- c) i) Write down Warshall's algorithm. Explain with example. 4
- ii) Explain pigeonhole principle with example. 4

UNIT - III

3. a) Define and explain the following terms with example. 8
- i) Linear Recurrence Relation with constant coefficients.
- ii) Homogeneous solution, particular solution.
- b) i) Explain the concept of strassen's matrix multiplication. 4
- ii) Write short notes on tractable and intractable problem. Justify with example. 4
- c) Write algorithm for bubble sort. Apply the same on numbers 70, 10, 60, 20, 50, 30, 40. Sort these numbers in Ascending order. Explain the worst - Case time complexity of bubble sort algorithm. 8

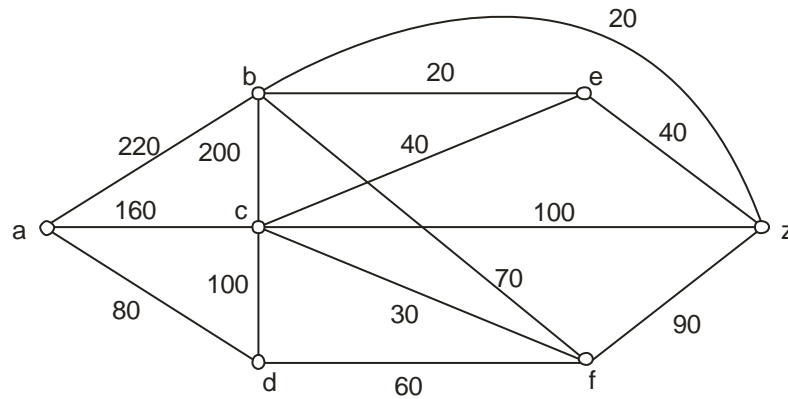
UNIT - IV

4. a) Explain the terms planner graph, Euler's circuit, Hamiltonian circuit, complete bipartite graph with example of each. 8
- b) i) Explain Huffman algorithm. Apply the same on following weights. 10, 20, 40, 50, 60, 90, 100, 120. 4
- ii) Explain prim's algorithm. Apply the same on below graph to find minimum spanning tree. 4



- c) Write and explain Dijkstra's shortest path algorithm. Apply the same on following graph. Justify time complexity.

8



UNIT - V

5. a) Convert following.

8

- i) $(132.58)_{10} = (?)_2$
- ii) $(1011011)_2 = (?)_{10}$
- iii) $(347)_8 = (?)_{10}$
- iv) $(746)_{10} = (?)_4$

- b) Explain the terms Semi group, Monoid, Ring Isomorphism with suitable example of each.

8

- c) Explain distributive lattice, complements lattice. Justify with example of each.

8
