

B.E. Computer Science & Engineering (Model Curriculum) Semester - IV
SE202CS - Design & Analysis of Algorithms

P. Pages : 3

Time : Three Hours



GUG/S/23/13807

Max. Marks : 80

- Notes :
1. All questions are compulsory.
 2. All questions carry equal marks.
 3. Assume suitable data wherever necessary.

1. a) Solve the following recurrence by characterized method and general solution. 8
 $T(n) = T(n/4) + \sqrt{n} + 4$ for $n \geq 4$
 $T(1) = 4$

- b) What is an algorithm? Explain characteristics of algorithm. 4
c) What are the different Asymptotic notations? Explain them with example. 4

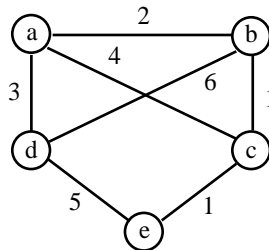
OR

2. a) Write an algorithm for Binary Search. And find out average number of comparisons requires for successful and unsuccessful binary search on following array: 8
-12, 23, 31, 45, 56, 78, 90, 103, 113, 126, 157

- b) Write an algorithm of insertion sort and derive worst case and best case run time complexity for insertion sort. 8

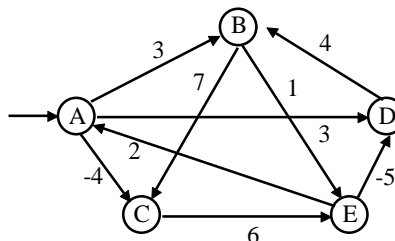
3. a) Write an Merge Sort Algorithm. Illustrate stepwise execution of merge sort on following input array: 8
 $A = \langle 15, 10, 5, 20, 25, 30, 40, 35 \rangle$
Also find recurrence relation for the algorithm and analyze it's time complexity.

- b) What is minimum spanning tree? Write Prim's algorithm for finding minimum cost spanning tree. Also give stepwise illustration of his algorithm using suitable example. 8



OR

4. a) Find the single source shortest path using Bellman-Ford's algorithm for the following graph. 8



- b) Explain Job sequencing approach. Find best possible sequences for following instances of deadlines using Greedy approach. 8

Job	1	2	3	4	5	6	7
Gain	3	5	20	18	1	6	30
Deadline	1	3	4	3	2	1	2

5. a) Compute probability matrix, evoluty & root matrix for optimal binary search tree. Construct the optimal binary search tree & cost of successful and unsuccessful search. 12

	0	1	2	3	4	5
		k1	k2	k3	k4	k5
Pi	-	0.20	0.10	0.05	0.10	0.05
qi	0.10	0.05	0.10	0.15	0.05	0.05

- b) Differentiate between Greedy approach and Dynamic programming. 4

OR

6. a) What is Travelling salesman problem? Implement it for the given matrix. 8

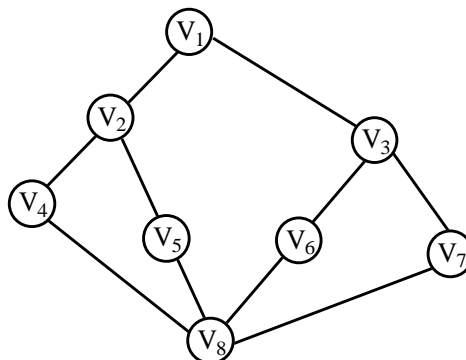
0	11	12	14
18	0	5	16
19	19	0	20
21	16	12	0

- b) Write an algorithm to find Longest Common Subsequences (LCS) and Implement LCS for the following sequence. 8

x = POLYNOMIAL
y = EXPONENTIAL

7. a) What is backtracking? Explain the application in which backtracking principle can be used to design a solution. 8

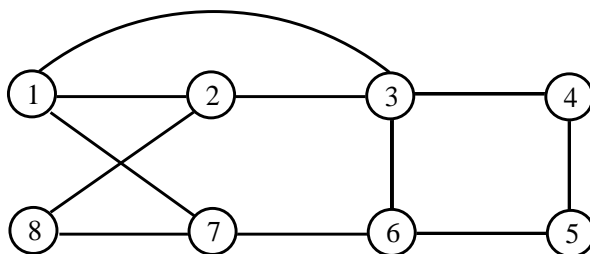
- b) Write an algorithm to obtain the depth first search tree & obtain the DFS for the given graph. 8



OR

8. a) Write an algorithm for n-queen problem. Show the stepwise execution to place 4 Queens in 4 * 4 matrix such that no two queens are in same row, same column or diagonally opposite. 8

- b) Define Hamiltonian cycle. Write the algorithm for the same & find the Hamiltonian cycle for the following graph. 8



9. a) State and explain Cook's theorem. 8
- b) Write a non-deterministic algorithm to generate CLIQUE of size k from graph of n vertices. 8

OR

10. a) Write a note on: 8
- i) NP-Hard
- ii) NP-Complete
- b) What is non-deterministic algorithm? Explain primality testing. 8
