

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

P. Pages : 3  
 Time : Three Hours



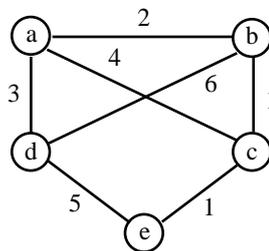
**GUG/S/23/13807**  
 Max. Marks : 80

- 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**

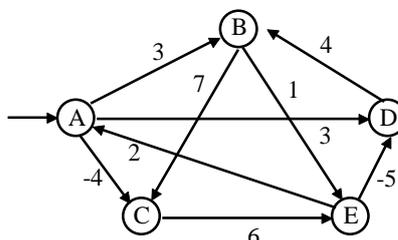
**OR**

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, evolutry & 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

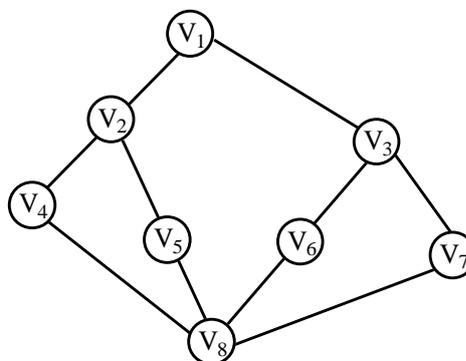
0	11	12	14
18	0	5	16
19	19	0	20
21	16	12	0

- 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

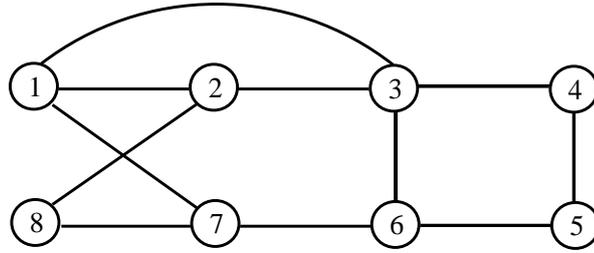
- b) Write an algorithm to obtain the depth first search tree & obtain the DFS for the given graph. 8



**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

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