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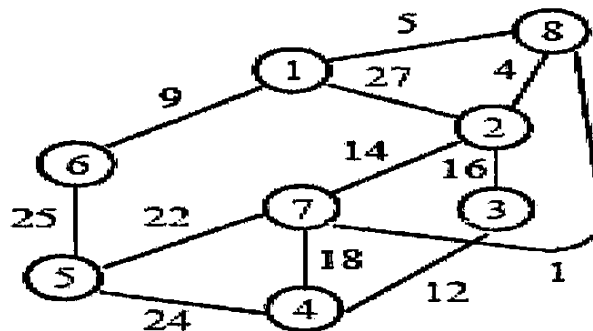# SE202CS - Design & Analysis of Algorithms

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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 Characterised method and general solution: **8**

$$T(n) = \begin{cases} 1 & , \text{if } n = 1 \\ 2T(n/2) + n & \text{otherwise} \end{cases}$$

B) Find the exact time complexity of summation of array of size 'n' using iterative approach. **4**

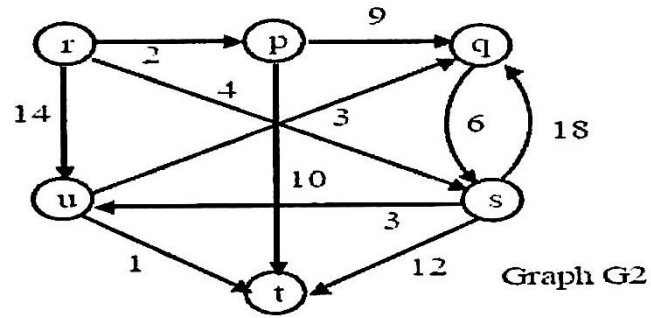**C)** Describe the different Asymptotic notations. Discuss it with example. **4**

OR

2. **A)** Write an algorithm for Binary Search. Draw BST for the following array. What is the maximum number of key comparisons made by binary search in searching for a key in the following array? **8**
9, 12, 15, 24, 30, 36, 45, 70

B) Write an algorithm of Bubble Sort and Derive worst case and best case run time complexity of it. **8**

3. **A)** Write an Quick Sort Algorithm. Illustrate stepwise execution of quick sort on following input array: **8**
A = <9, 7, 5, 11, 12, 2, 14, 3, 10, 6>
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 this algorithm using suitable example. **8**

OR

4. A) Write a Dijkstra's algorithm Find the single source shortest path for the following graph-G2. **8**

Graph G2

B) Write an Huffmann Code algorithm. Find the code for the following symbols whose probabilities are given in for following tables. **8**
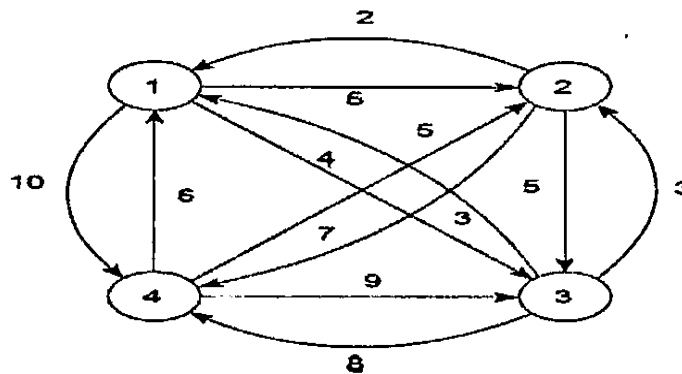
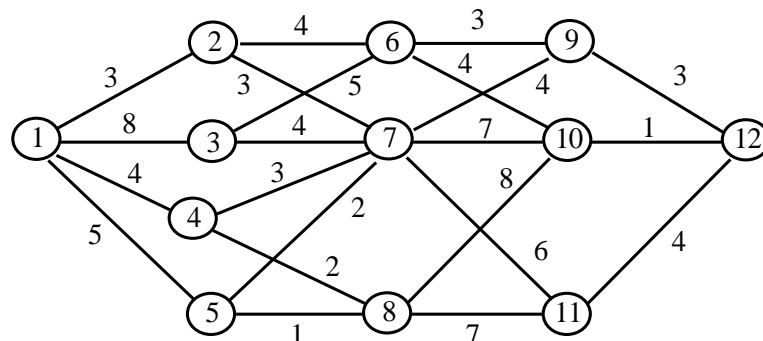| I =	1	2	3	4	5	6
Symbol (i)	A	B	C	D	E	F
Frequency (i)	45	13	12	16	9	5

OR

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 **16**

i =	0	1	2	3	4	5
		k1	k2	k3	k4	k5
p_i	-	0.20	0.10	0.05	0.10	0.05
q_i	0.10	0.05	0.10	0.15	0.05	0.05

6. A) What is Travelling salesman problem? Implement it for the given graph. **8**
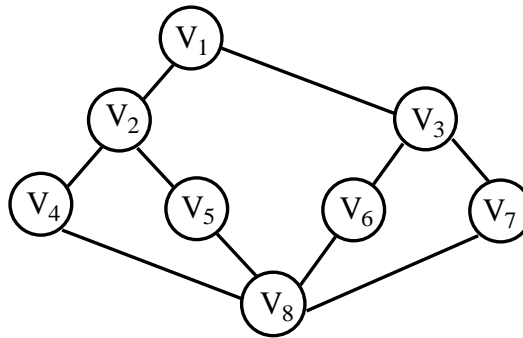

B) Apply Dynamic programming for the following multistage graph and find the shortest path between Vertex 1 and Vertex 12 using forward approach. **8**

7. A) What is backtracking? Explain the application in which backtracking principle can be used to design a solution. **8**
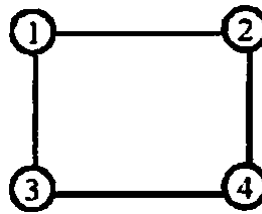
B) Write an algorithm to obtain the depth first search tree & obtain the DFS for the given graph. **8**

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) Implement graph coloring on following graph & generate space tree if number of permitted colours = 3. **8**

9. A) State and explain Cook's theorem. **8**

B) Explain clearly polynomial reduction and how it can be used to show that a problem is NP -complete. **8**

OR

10. A) Write a note on decision and optimization problem. **8**

B) What is non-deterministic algorithm? Explain primality testing. **8**

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