

P. Pages : 4

Time : Three Hours

**NKT/KS/17/7355**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Solve the given recurrence relation $t_n - 2t_{n-1} = (n+5) 3^n$ for $n \geq 1$. 7

b) Solve the following Non-homogeneous recurrence; 6

$$t_n = \begin{cases} n & \text{if } n = 0 \text{ or } n = 1 \\ 5t_{n-1} - 6^n & \text{otherwise} \end{cases}$$

OR

2. a) Solve the following recurrence relation: 7

$$T(n) = T\left(\frac{n}{u}\right) + \sqrt{n} + 4 \quad \text{for } n \geq 4$$

$$T(1) = 4$$

b) Solve the following recurrence relation using Master theorem. 4

i) $T(n) = 4T(n/2) + n^2$

ii) $T(n) = 4T(n/2) + n$

c) Explain the difference between recursion tree method and iteration method of algorithm analysis. 2

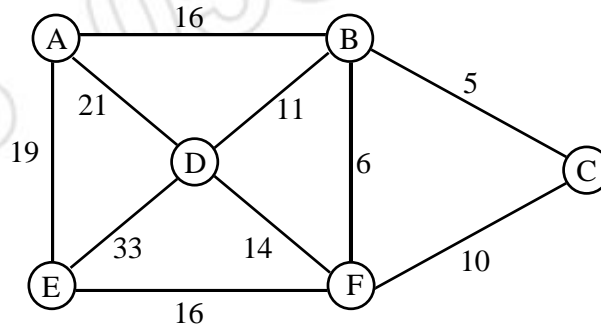
3. a) Sort the given array using insertion sort algorithm. Write its algorithm & also explain the complexity of insertion sort algorithm: 7

40 80 35 90 45 50 70.

b) Show the lower bound for any sorting algorithm which does sorting by comparison of keys of $n \log n$. 6

OR

4. a) What do you mean by amortized analysis of algorithm? Explain with suitable example. **5**
- b) Implement biotonic sorting network for the following set of information **5**
 3 5 8 9 10 12 14 20 95 90 60 40 35 23 18 0
- c) What are different asymptotic notations? Explain them briefly. **3**
5. a) Compute a minimum cost spanning tree for the following graph using Kruskal algorithm and explain its complexity. **7**



- b) Write a Greedy algorithm for job scheduling problem with deadline. Implement it to the following jobs to obtain maximum profit. **7**

Job No.	Profit	Deadline
1	20	3
2	15	1
3	10	1
4	07	3
5	05	1
6	03	3

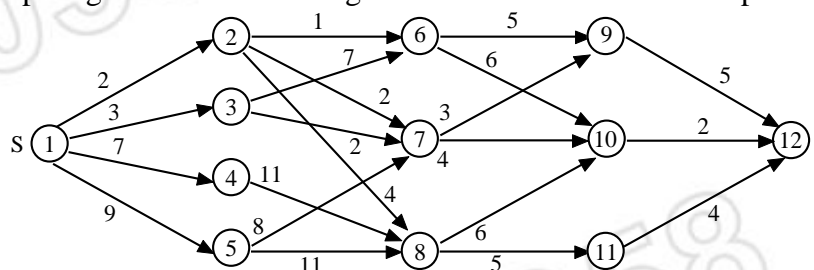
OR

6. a) For the following Knapsack sequence of objects find profit by three methods. Capacity = 30 Number of objects = 07. **7**

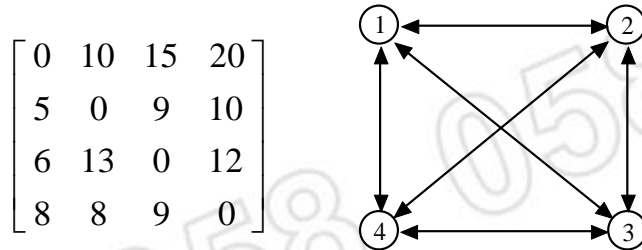
Object :	1	2	3	4	5	6	7
Weight :	4	6	10	14	2	8	2
Profit :	20	15	20	28	8	18	6

- b) What are the optimal Huffman codes for the following set of frequencies & discuss its complexity & write the algorithm for the same a : 50 b : 25 c : 15 d : 40 e : 75. **7**

7. a) For the following graph, find the shortest path from source 's' to destination 't' using multistage graph algorithm. Write its algorithm & also discuss its complexity. **7**



- b) What is travelling salesman problem? Implement Travelling salesman problem for the following matrix representing complete graph using dynamic programming. 7



OR

8. a) Draw optimal binary search tree of $n = 5$ with following probabilities. 7

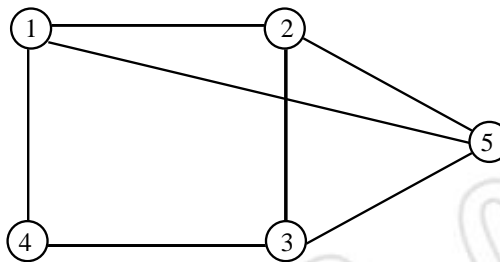
I:	0	1	2	3	4	5
P:	-	0.15	0.10	0.05	0.10	0.20
Q:	0.05	0.10	0.05	0.05	0.05	0.10

- b) Write an algorithm to generate longest common subsequence (LCS) Apply the algorithm on the following string & generate LCS with the help of LCS matrix. 7

A =	e	x	p	o	n	e	n	t	i	a	l
B =	p	o	l	y	n	o	m	i	a	l	

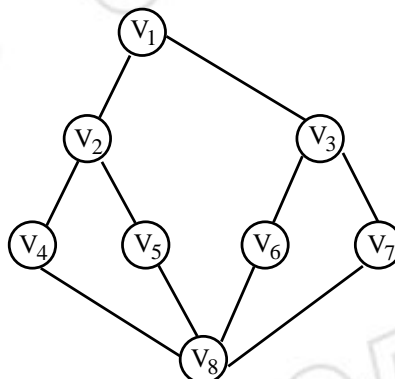
9. a) Write an algorithm to solve '8 Queen' problem. Explain explicit and implicit constraints of this problem. Also explain how back tracking technique can be applied to solve this problem. 7

- b) Explain Graph coloring problem. Explain how this problem can be solved. by backtracking method. Draw solution space tree for the given graph. How many colors are required? 6

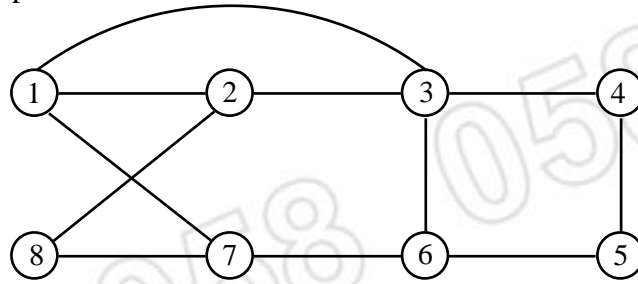


OR

10. a) Write an algorithm to obtain the depth first search tree & obtain the DFS for the given graph. 7



- b) Define Hamiltonian cycle. Write the algorithm for the same & find the Hamiltonian cycle for the following graph. 6



11. a) State and explain Cook's theorem. 7
- b) Write short notes on: 6
- 1) NP hard & NP complete.
 - 2) Non-deterministic sorting
 - 3) Decision & optimization problem.

OR

12. a) Write a non-deterministic algorithm to generate CLIQUE of size k from graph of n vertices. 6
- b) Explain polynomial reduction & discuss how it can be used to show that a problem is NP-complete. 7
