

B.E. (Information Technology) Fifth Semester (C.B.S.)  
**Design & Analysis of Algorithms**

P. Pages : 3

Time : Three Hours



TKN/KS/16/7443

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) Explain the characteristics root equation method for the solution of Recurrence relation? **5**
- b) Solve following recurrence using master method. **8**
- i)  $T(n) = 2T\left(\frac{n}{2}\right) + n$
  - ii)  $T(n) = 4T\left(\frac{n}{2}\right) + n^2$
  - iii)  $T(n) = 8T\left(\frac{n}{4}\right) + \Gamma n$
  - iv)  $T(n) = 9T\left(\frac{3n}{5}\right) + n^3$

**OR**

2. a) Differentiate between following. **6**
- i) Greedy & dynamic programming.
  - ii) Homogeneous & nonhomogeneous recurrences.
  - iii) Divide and conquer & dynamic programming.
- b) Solve following : **7**
- 1)  $T(n) = \begin{cases} n & \text{if } n = 0 \text{ or } n = 1 \\ T(n-1) + 1 & \text{otherwise} \end{cases}$
  - 2)  $T(n) = \begin{cases} n & \text{if } n = 0 \text{ or } n = 1 \\ 5t_{n-1} - 6^n & \text{otherwise} \end{cases}$
3. a) What is bitonic sorting network? Explain merging network with help of example? **6**

- b) Explain Asymptotic notation & calculate upper, lower & tight bound of following. 7
- a)  $6^{3n} + 5$
- b)  $20n^2 + 14n + 1$
- c)  $200n + 8$

**OR**

4. a) Sort the given using insertion sort algorithm. Also explain the complexity of insertion sort 6  
4, 1, 3, 2, 16, 9, 10, 14, 8, 7
- b) What is Amortized Complexity? Explain all the methods of Amortized Analysis with 8 bit binary increment operation. 7
5. a) What is greedy strategy? Explain the characteristics of greedy Algorithms? 6
- b) Write an algorithm for Huffman code? Implement it on following data & calculate variable length encoding. 8

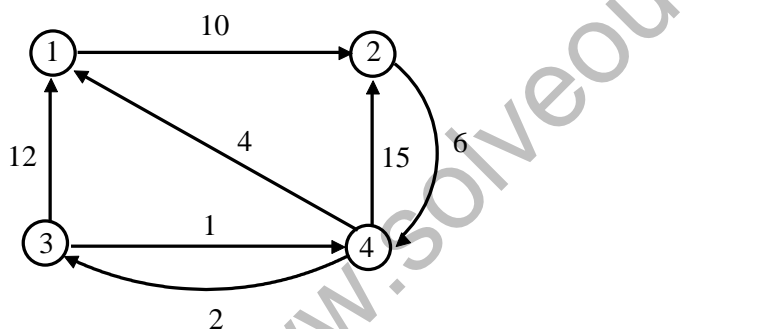
a : 45	b : 12	c : 9	d : 13	g : 30
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**OR**

6. a) Implement binary search for following data find the Average number of successful & unsuccessful comparisons. 7  
10, 0, -9, 8, 16, -45, 28, 123  
Also find complexity of binary search.
- b) Schedule the following jobs using job scheduling algorithm. Also write the algorithm for Job Scheduling. 7

Job	Profit	Dead line
1	10	2
2	50	1
3	9	2
4	26	3
5	18	2

7. a) Write an algorithm for Floyd Warshall & Solve following. 8



b) Write an algorithm to find and print LCS. 6

**OR**

8. a) Write an algorithm for OBST & solve following. 8

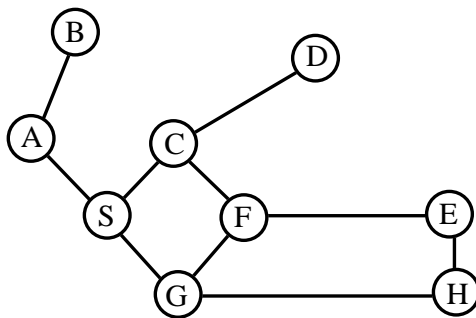
n	0	1	2	3	4
$p_i$		0.15	0.15	0.15	0.15
$q_i$	0.03	0.07	0.15	0.05	0.10

b) Find optimal solution to knapsack instance  $n = 7$   $m = 15$  6

$$(P_1, P_2, \dots, P_7) = (15, 20, 10, 7, 6, 18, 3)$$

$$(W_1, W_2, \dots, W_7) = (2, 3, 5, 7, 1, 4, 1)$$

9. a) Differentiate between DFS & BFS & solve following using both BFS & DFS? 7



b) What is 8 - queen problem? Write an algorithm for 8 – queen problem? 6

**OR**

10. a) Write an approximation algorithm for TSP (Travelling Sales Person) & Explain with example? 7

b) Generate the space free for following data using sum of subset problem 6

$$S = \{10, 9, 15, 5, 1\}$$

$$M = 25$$

11. Write an algorithm for following : 13

- i) Clique
- ii) Graph Partitioned in Traigle.
- iii) Independent set problem.

**OR**

12. Explain following. 2

- 1) NP 2
- 2) Characteristics of NP 3
- 3) Non deterministic sorting. 4
- 4) Non deterministic searching. 4

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