M.Tech. (Computer Science & Engineering) Second Semester (C.B.C.S.)
Advances in Algorithms

P. Pages : 3

Time : Three Hours

1528

Max. Marks : 70

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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. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.

1. a) What is amortized complexity? Find potential candidates for 4-bit binary incrementor using the different methods of Amortized Analysis. **9**

b) Find the exact time complexity of summation of array of size 'n' using iterative and recursive approach. **5**

OR

2. a) What are the different Asymptotic notations? Explain them briefly. Also find upper, lower & tight bound for $20n^2 + 8n + 10$ & $3n + 2$. **8**

b) Perform the following operation on Fibonacci Heap. **6**
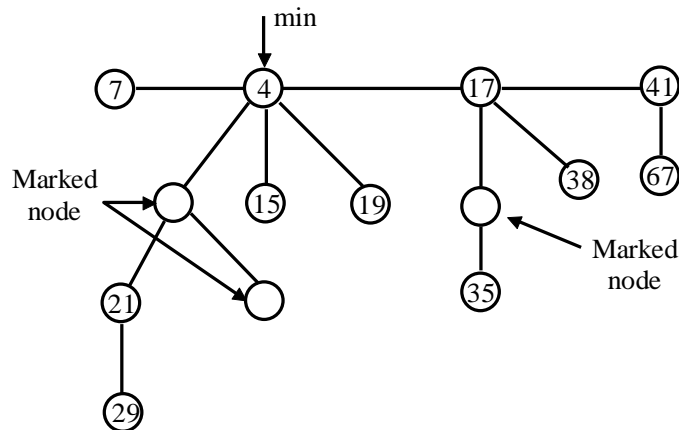
i) Delete the min node.
ii) Calculate potential function of given Fibonacci Heap.
iii) Decrement 35 by 5.
iv) Insert 21 in the given Fibonacci Heap.

3. a) What is the significance of Optimal Binary Search tree (OBST)? For the following probabilities draw the OBST by generating 'w', 'e' and 'r' matrices. Also find the cost of OBST. Write an algorithm to construct the three matrices. **10**
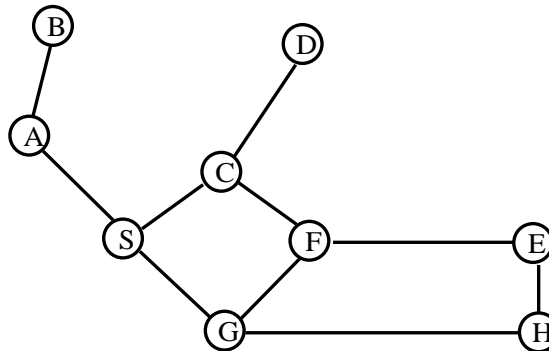Probabilities

i	0	1	2	3	4	5
bi	-	0.10	0.15	0.10	0.15	0.10
qi	0.05	0.05	0.10	0.05	0.05	0.10

b) Explain the use of Huffman code write Huffman code for following set of frequencies : **4**
a:35, b:23, c:10, d:26, e:9, f:3.

OR

4. a) Differentiate between DFS & BFS and solve following using both BFS & DFS : **6**

b) Find out optimal solution for fractional knapsack problem using greedy strategy for following instances : **8**
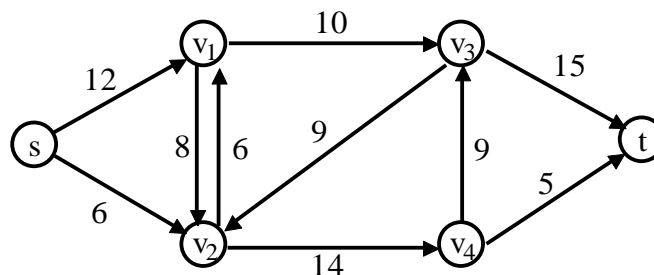
$$n = 7$$
$$m = 15$$
$$(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$$
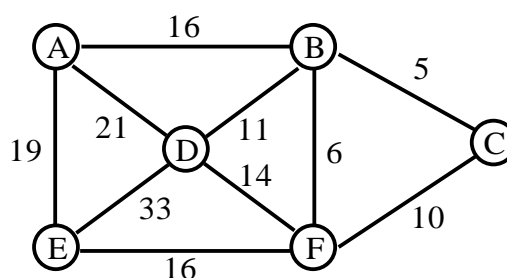$$(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$$

5. a) Implement Ford-Fulkerson algorithm on the following graph. Also write the algorithm. **10**

b) Discuss Hamiltonian cycle. Write an algorithm for finding Hamiltonian cycle for a graph. **4**

OR

6. a) Compute a minimum cost spanning tree for the following graph using KRUSKAL's algorithm & explain its complexity. **8**

b) What is Bipartite matching? Explain with the help of graph the concept of maximum bipartite matching. **6**

7. a) Explain string matching using finite automata for pattern   **10**
P = aabab and text string
T = aaababaabaababaab
apply string matching.

b) Explain and write algorithm for simplified DES encryption scheme.   **4**

<div align="center">**OR**</div>

8. a) Explain modular exponentiation using the Chinese Remainder theorem.   **8**

b) What is Text compression? What are the different possible ways for text compression?   **6**

9. a) Write and explain the simplex classical algorithm for solving linear programs. Explain   **9**
why its running time is not polynomial in the worst case.

b) Explain the 3 classes of the problem class P, class NP, class NP-complete with suitable   **5**
example.

<div align="center">**OR**</div>

10. a) What are Randomized algorithms? Explain the advantages and scope of Randomized   **8**
algorithms.

b) Prove that if n is composite then its smallest prime factor is $\leq \sqrt{n}$.   **6**

<div align="center">*************</div>