

Code No: RR210504

RR

Set No. 2

II B.Tech I Semester Examinations, November 2010

DESIGN AND ANALYSIS OF ALGORITHMS

Common to Information Technology, Computer Science And Engineering,
Computer Science And Systems Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Describe the graph-coloring problem.
(b) Explain the recursive Backtracking algorithm for graph coloring [8+8]
2. (a) Describe the Brute force algorithm for evaluating a polynomial. What is its time complexity?
(b) Solve the recurrence relation $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$ with initial conditions $a_0 = 1, a_1 = 4$ and $a_2 = 8$. [6+10]
3. Explain the Prim's algorithm with an example. Analyze the time complexity of the algorithm. [16]
4. (a) While executing each UNION instruction, the root of the tree with fewer vertices (ties are broken arbitrarily) is made a son of the root of the larger, then no tree in the forest of trees will have the height greater than or equal to h unless it has at least 2^h vertices. Prove this lemma using induction.
(b) Compute the order of the worst case, execution time for n UNION and n FIND instructions for the above case.
(c) Sketch the forest of trees before the path compression and after the path compression. [6+5+5]
5. Write a recursive and iterative algorithm to find the
 - (a) number of nodes in a binary tree.
 - (b) sum of contents of all nodes in a binary tree. [8+8]
- 6a) Write the algorithm for the traveling salesperson problem using branch and bound techniques.
(b) For the cost matrix of a Traveling salesperson problem, find the reduced cost matrix. [8+8]

$$\begin{bmatrix}
 \infty & 7 & 3 & 12 & 8 \\
 3 & \infty & 6 & 14 & 9 \\
 5 & 8 & \infty & 6 & 18 \\
 9 & 3 & 5 & \infty & 11 \\
 18 & 14 & 9 & 8 & \infty
 \end{bmatrix}$$
7. (a) Trace Merge sort and Quick sort for the following data set.
10, 30, 15, 45, 25, 30, 35, 20, 30, 40, 50
(b) Compare their time complexities. [8+8]

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8. a) Draw the state space tree generated by FOFOBB and Backtracking.
b) Which of the above techniques is more efficient and why? [16]

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1. Write a recursive and iterative algorithm to find the
 - (a) number of nodes in a binary tree.
 - (b) sum of contents of all nodes in a binary tree. [8+8]
2. (a) Describe the graph-coloring problem.
 (b) Explain the recursive Backtracking algorithm for graph coloring [8+8]
3. a) Draw the state space tree generated by FOFOB and Backtracking.
 b) Which of the above techniques is more efficient and why? [16]
4. Explain the Prim's algorithm with an example. Analyze the time complexity of the algorithm. [16]
5. (a) Describe the Brute force algorithm for evaluating a polynomial. What is its time complexity?
 (b) Solve the recurrence relation $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$ with initial conditions $a_0 = 1, a_1 = 4$ and $a_2 = 8$. [6+10]
- 6a) Write the algorithm for the traveling salesperson problem using branch and bound techniques.
 (b) For the cost matrix of a Traveling salesperson problem, find the reduced cost matrix. [8+8]

$$\begin{bmatrix}
 \infty & 7 & 3 & 12 & 8 \\
 3 & \infty & 6 & 14 & 9 \\
 5 & 8 & \infty & 6 & 18 \\
 9 & 3 & 5 & \infty & 11 \\
 18 & 14 & 9 & 8 & \infty
 \end{bmatrix}$$
7. (a) While executing each UNION instruction, the root of the tree with fewer vertices (ties are broken arbitrarily) is made a son of the root of the larger, then no tree in the forest of trees will have the height greater than or equal to h unless it has at least 2^h vertices. Prove this lemma using induction.
 (b) Compute the order of the worst case, execution time for n UNION and n FIND instructions for the above case.

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- (c) Sketch the forest of trees before the path compression and after the path compression. [6+5+5]
8. (a) Trace Merge sort and Quick sort for the following data set.
10, 30, 15, 45, 25, 30, 35, 20, 30, 40, 50
- (b) Compare their time complexities. [8+8]

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Set No. 1

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Time: 3 hours

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Answer any FIVE Questions
All Questions carry equal marks

1. Write a recursive and iterative algorithm to find the
 - (a) number of nodes in a binary tree.
 - (b) sum of contents of all nodes in a binary tree. [8+8]
2. (a) Trace Merge sort and Quick sort for the following data set.
10, 30, 15, 45, 25, 30, 35, 20, 30, 40, 50
(b) Compare their time complexities. [8+8]
3. (a) Describe the Brute force algorithm for evaluating a polynomial. What is its time complexity?
(b) Solve the recurrence relation $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$ with initial conditions $a_0 = 1, a_1 = 4$ and $a_2 = 8$. [6+10]
4. Explain the Prim's algorithm with an example. Analyze the time complexity of the algorithm. [16]
5. (a) While executing each UNION instruction, the root of the tree with fewer vertices (ties are broken arbitrarily) is made a son of the root of the larger, then no tree in the forest of trees will have the height greater than or equal to h unless it has at least 2^h vertices. Prove this lemma using induction.
(b) Compute the order of the worst case, execution time for n UNION and n FIND instructions for the above case.
(c) Sketch the forest of trees before the path compression and after the path compression. [6+5+5]
6. (a) Describe the graph-coloring problem.
(b) Explain the recursive Backtracking algorithm graph coloring [8+8]
7. a) Draw the state space tree generated by FOFOBB and Backtracking.
b) Which of the above techniques is more efficient and why? [16]

8a) Write the algorithm for the traveling salesperson problem using branch and bound techniques.

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- (b) For the cost matrix of a Traveling salesperson problem, find the reduced cost matrix. [8+8]

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

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Set No. 3

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DESIGN AND ANALYSIS OF ALGORITHMS

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Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1a) Write the algorithm for the traveling salesperson problem using branch and bound techniques.

(b) For the cost matrix of a Traveling salesperson problem, find the reduced cost matrix. [8+8]

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

2. Explain the Prim's algorithm with an example. Analyze the time complexity of the algorithm. [16]

3. (a) While executing each UNION instruction, the root of the tree with fewer vertices (ties are broken arbitrarily) is made a son of the root of the larger, then no tree in the forest of trees will have the height greater than or equal to h unless it has at least 2^h vertices. Prove this lemma using induction.(b) Compute the order of the worst case, execution time for n UNION and n FIND instructions for the above case.

(c) Sketch the forest of trees before the path compression and after the path compression. [6+5+5]

4. a) Draw the state space tree generated by FOFOBB and Backtracking.

b) Which of the above techniques is more efficient and why? [16]

5. (a) Trace Merge sort and Quick sort for the following data set.
10, 30, 15, 45, 25, 30, 35, 20, 30, 40, 50

(b) Compare their time complexities. [8+8]

6. (a) Describe the Brute force algorithm for evaluating a polynomial. What is its time complexity?

(b) Solve the recurrence relation $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$ with initial conditions $a_0 = 1, a_1 = 4$ and $a_2 = 8$. [6+10]

7. (a) Describe the graph-coloring problem.

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- (b) Explain the recursive Backtracking algorithm graph coloring [8+8]
8. Write a recursive and iterative algorithm to find the
- (a) number of nodes in a binary tree.
 - (b) sum of contents of all nodes in a binary tree. [8+8]

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