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Question Paper Code : C 1169

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Third/Fourth Semester

Computer Science and Engineering

CS 1201 — DESIGN AND ANALYSIS OF ALGORITHMS

(Regulation 2004)

(Common to B.E (Part-Time) Second Semester – Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. How does an optimal solution differ from a feasible solution?
2. Formally, define Ω notation.
3. How does an algorithm differ from a program?
4. What do you mean by linear algorithm?
5. What is the non-asymptotic value of average case analysis of linear search when the element is found in the array?
6. What is the difference between traversal and searching?
7. What does the principle of optimality say?
8. State subset sum problem.
9. Compare and contrast decrease and conquer vs. divide and conquer.
10. Write recursive algorithm for inorder traversal on a binary tree.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) What is wrong in the following?

$$\begin{aligned} 1 + 2 + \dots + n &= O(\max\{1, 2, \dots, n\}) \\ &= O(n) \end{aligned} \quad (4)$$

- (ii) Prove that $\log n \in O(\sqrt{n})$ but $\sqrt{n} \notin O(\log n)$ (8)

- (iii) Prove that $O(f(n)) + O(g(n)) = O(\max\{f(n), g(n)\})$. (4)

Or

- (b) (i) Write a recursive algorithm for tower of Hanoi problem and determine the time complexity of the algorithm. (6)

- (ii) Write an algorithm for finding the product of two 2-dimensional matrices. What is the time complexity of your algorithm? (6)

- (iii) Write an $\Theta(\log n)$ algorithm for counting number of digits in the binary representation of a positive integer. (4)

12. (a) Describe the best case, worst case and average case behaviour of Quick sort algorithm.

Or

- (b) Explain the depth first search and breadth first search techniques on an undirected graph. What is the time complexities of these algorithms, when the graph is represented using adjacency list?

13. (a) (i) Illustrate the four rotations performed on AVL tree with neat diagrams. (8)

- (ii) Create an AVL tree for the following data and show the tree after insertion of each key. (8)

45, 37, 24, 56, 78, 83, 42, 32, 12, 48

Or

- (b) (i) Explain Warshall's algorithm for finding transitive closure of a directed graph. (8)

- (ii) Construct a heap and sort the following data using heap sort technique. (8)

45, 37, 24, 56, 78, 83, 42, 32, 12, 48

14. (a) Explain Prim's algorithm for finding minimum spanning tree of a weighted graph. Illustrate and hand simulate the algorithm with a non-trivial example.

Or

- (b) Explain Dijkstra's algorithm for finding shortest paths on a graph. Illustrate and hand simulate the algorithm with a non-trivial example.

15. (a) Explain the design approach for solving n-queens problem using backtracking technique.

Or

- (b) Explain the design approach for solving Knapsack problem using branch and bound technique.
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