

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2125)

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B. Tech 5th Semester Examination
Analysis and Design of Algorithms (NS)
CS-313

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions by selecting one question from each section A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) What is amortization? How algorithm efficiency is measured? (10)
- (b) An algorithm runs a given input of size n . If n is 4096, the run time is 512 milliseconds. If n is 16384, the run time is 2048 milliseconds. What is the complexity of the algorithm? Write it in terms of big O notation. (10)
2. (a) What is meant by algorithm analysis? What to analyze in an algorithm? (10)
- (b) Order the following functions by growth rate: N , $N^{1.5}$, N^2 , $N \log N$, $N \log^2 N$, $3N$, 57 , $N^2 \log N$. (10)

SECTION - B

3. (a) Give an analysis of worst case running time of Quicksort. When does it occur? How can we improve the worst case performance of Quicksort? (10)
- (b) What is meant by backtracking? Explain with the help of 8 queens problem. (10)

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4. (a) What is optimal binary search tree? Explain its use with the help of suitable example. (10)
- (b) Write mathematical formulation of 0-1 knapsack problem. Use dynamic programming approach to solve the following instance of the problem
Maximum capacity = 11 units
No of items = 5
Weights = 1, 2, 5, 6, 7
Profits = 1, 6, 18, 22, 28 (10)

SECTION - C

5. (a) State Bellman's principle of optimality. Also show that how it is valid for shortest path problem with non-negative weights on the edges. (10)
- (b) What is meant by approximation algorithm? Explain set covering problem with the help of suitable example. (10)
6. (a) How the efficiency of a parallel algorithm is measured? By giving an example of a parallel algorithm find its efficiency. (10)
- (b) Explain Johnson's algorithm for sparse graph with the help of suitable example. (10)

SECTION - D

7. (a) What do you mean by NP complete problem? How do we establish that a problem is NP-Complete? (10)
- (b) Explain Cook's theorem with the help of suitable example. (10)
8. (a) How does maximum bipartite matching work? Discuss with suitable example. (10)
- (b) What is a parallel algorithm? How computational complexity of a parallel algorithm can be measured? (10)

SECTION - E

9. Discuss the following in brief:

- (a) Data analysis
- (b) Asymptotic notation
- (c) Topological sort
- (d) Flow shop scheduling
- (e) Graph coloring
- (f) Red black tree
- (g) Comparison tree
- (h) Set covering
- (i) Cryptographic computation
- (j) Multicast routing.

(2×10=20)