(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2165 Roll No. | | | | | | | | | | |



## B. Tech.

## (SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

## DESIGN AND ANALYSIS OF ALGORITHMS

*Time : 3 Hours* *Total Marks : 100*

**Note :** (1) Attempt **all** questions.

(2) All questions carry equal marks.

(3) Be precise in your answer.

1. Attempt any **four** of the following :— **(5×4=20)**

(a) Determine the asymptotic order of the following functions :

(i) $f(n) = 3x^2 + 5$

(ii) $f(n) = 2^n + 5n + 3$

(iii) $f(n) = \sum_{i=1}^{n} i^2$

(iv) $f(n) = 5$

(v) $f(n) = n + 7$.

(b) Why do we use asymptotic notation in the study of algorithm ? Explain in brief various asymptotic notations and give their significance.

(c) Solve the following recurrence using Master method :

$T(n) = 4T(n/3) + n^2$.

(d) Discuss any one sorting algorithm having linear time complexity.

(e) Explain and write partitioning algorithm for quick sort.

(f) Write an algorithm to count the number of nodes in a given circular linked list.

2. Attempt any **two** of the following :— **(10×2=20)**

(a) Explain red-black tree. Prove that a red-black tree with n internal nodes has height at most $2 \log_2(n+1)$.

(b) Explain and write an algorithm for union of two binomial heaps. Also discuss the time complexity for the same.

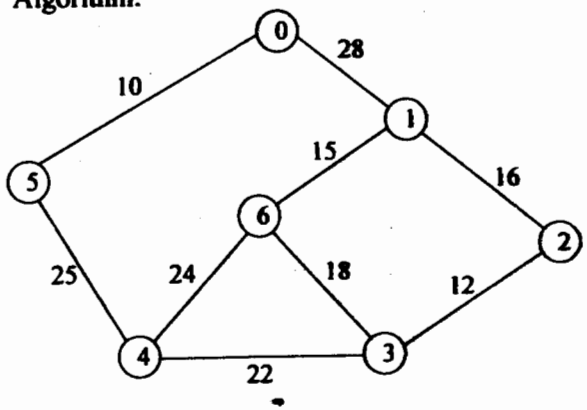
(c) Write short notes on the following :—

(i) B-Trees.

(ii) Fibonacci heaps.

3. Attempt any **two** of the following :— **(10×2=20)**

(a) Define minimum cost spanning tree. Write Prim's algorithm to generate a minimum cost spanning tree for any given weighted graph. Generate minimum cost spanning tree for the following graph using Prim's Algorithm.






(b) Write an algorithm to find minimum and maximum elements simultaneously from a given list of elements. You are also required to discuss its running time.

(c) Explain and write an algorithm for Greedy method of algorithm design. Given 10 activities along with their start and finish time as

$S = \{A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}\}$

$S_i = \{1, 2, 3, 4, 7, 8, 9, 9, 11, 12\}$

$F_i = \{3, 5, 4, 7, 10, 9, 11, 13, 12, 14\}$

Compute a schedule where the largest numbers of activities take place.

4. (a) Discuss the dynamic programming solution to longest common subsequence (LCS) problem. Write an algorithm to compute an LCS of two given strings.

(b) Describe the Warshall's and Floyd's algorithm for finding all pairs shortest paths.

(c) Write short notes on the following :—

(i) Graph coloring

(ii) Hamiltonian cycles.



5. Attempt any **two** of the following :— **(10×2=20)**

(a) Show the comparisons the Naive-String matcher makes for the pattern P = {10001} in the text T = {000010001010} and also show that worst cast time to find the first occurrence of a pattern in a text is $O(n - m + 1)(m - 1)$.

(b) Explain and write Knuth-Morris-Pratt algorithm for pattern matching and also comment on its running time.

(c) Write short notes on the following :—

(i) Fast Fourier Transform.

(ii) NP-completeness.