[4660] - 417

M.E. (Computer) (Common to Computer Engg. & Comp. N/W)
APPLIED ALGORITHMS
(2008 Pattern) (Semester - I)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
   1) Answer any three questions from each section.
   2) Answers to the two sections should be written in separate answer books.
   3) Figures to the right indicate full marks.
   4) Assume suitable data, if necessary.

SECTION - I

Q1) a) A binary tree is a rooted tree in which each node has at most two children. Show by induction that for any binary tree, the number of nodes with two children is exactly one less than number of leaves.   **[10]**

b) Prove the following by Mathematical induction.   **[8]**

   i) $C(n, 0) + C(n, 1) + C(n, 2) + ... + C(n, n) = 2^n$.

   ii) $C(n, 0) - C(n, 1) + ... + (-1)^i C(n, i) + ... + (-1)^n C(n, n) = 0$

Q2) a) Consider the following code segment : search (int n, int x)

```
{
   int t [max] ;               // array holding max integers
   int t, x ;
   t [o] = x ;                 // t [o] is used as marker
   i  = n ;
   while (t [i] ! = x)
          i = i – 1;
   if (i > 0) then
      PrintF ("Found");
   else
       PrintF ("Not Found");
}
```

Assume uniform distribution and determine average search time for successful search.   **[6]**

b) In case of analyzing an algorithm, in what way, the amortized constant time differs from constant time on the average. **[4]**

c) Compare the sorting methods merge sort and quick - sort, device datasets which compare the average and worst case complexities for the two algorithms. **[6]**

Q3) a) Write an algorithm for Depth first search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not used this data structure can still we implement the same algorithm, if yes what is its complexity? **[8]**

b) Assume that you have functions F and g such that F (n) is O (g(n)) for each of the following statement, decide whether you think it is true or false. **[8]**

i) $\log_2 F(n)$ is $O(\log_2 g(n))$

ii) $2^{f(n)}$ is $O(2^{g(n)})$

Q4) a) Determine the running time of quick sort for **[8]**

i) Sorted input

ii) Random input

When pivot element is chosen as.

1) The first element

2) A random element

b) Show that if all internal nodes in a tree have degree K then the number of external nodes n is such that $n \bmod (K-1) = 1$. **[8]**

SECTION - II

Q5) a) Write an algorithm for finding Hamiltonian cycle in an undirected graph. How do you claim that, this algorithm is probabilistically good algorithm. **[8]**

b) Explain the following with respect to approximation algorithm. **[8]**

i) Approximate scheme

ii) Polynomial time approximation scheme

iii) Fully polynomial time approximation scheme.

Q6) a) Design on Dynamic programming algorithm for n matrices A1, A2, ...An of dimension P1 * P2, P2 * P3 .... Pn * Pn + 1, respectively our goal is to compute the matrix product A1, A2, ... An in an order such that it would take the minimum number of computations to derive the product. **[10]**

b) Write CRCW and EREW algorithms for parallel computers. **[8]**

Q7) a) State prefix computation problem. Write parallel algorithm for the same. Find the time complexity of this algorithm. **[8]**

b) What is Dynamic programming approach to solve the problem? Explain with suitable example. **[8]**

Q8) Write notes (any 4) : **[16]**

a) Prefix Computation

b) Dynamic programming Vs recursion

c) Pointer doubling problem

d) PRAM model

e) Probability function & discrete probability space

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