[4658] – 169

Seat No.	

T.E. (Information Technology) (Semester – II) Examination, 2014
DESIGN AND ANALYSIS OF ALGORITHMS
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B *: 1) Answer **three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer-books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Write two algorithms those are having different complexities to identify that the given string is a palindrome or not. Assume that the given string is array of the characters. Justify how these two algorithms has different complexities. **10**

   b) Reorder the following complexities from smallest to largest. **6**
   i) $n\log_2(n)$
   ii) $n+n^2+n^3$
   iii) 2^4
   iv) Sqrt(n)
   v) n!
   vi) $n^2/Log(n)$

   OR

2. a) Reorder the following complexities from smallest to largest. **6**
   i) 2^n
   ii) (n + 1)!
   iii) n^{logn}
   iv) Sqrt(n)
   v) 2^{2n}
   vi) $(1+e)^n$

   b) Discuss the Quick sort algorithm for the following data set to sort in ascending order, in which data set do you think that merge sort is not advisable to use. **10**
   1) 12, 12, 12, 12, 12
   2) 20, 15, 14, 11, 10
   3) 10, 1, 12, 15, 7

3. a) Design and analyze a divide and conquer algorithm for finding maximum and minimum element in a list L [1 : n]. **8**

P.T.O.

b) Trace the action of Huffman code for the letter (a, b, c, d, e, f, g, h) occurring with frequencies (10, 7, 3, 5, 9, 2, 3, 2) **8**

OR

4. a) Given a sequence of n-elements A[1].... A[n], assume that they are split into 2 sets A[1]... A[n/2] and A[n/2 + 1].... A[n] each set is individually sorted and the resulting sequence is merged to produce a single sorted sequence of n elements. Using the divide and conquer strategy, write a Merge sort algorithm to sort the sequence in non-decreasing order. **10**

b) What is greedy algorithmic approach ? How does it used to compute Huffman tree and Huffman code ? **6**

5. a) N = 3 and (a_1, a_2, a_3) = {do, if, while} let P (1 : 3) = (1/2, 1/10, 1/20) and q(1 : 3) = (0.15, 0.1, 0.05, 0.05)

Compute and construct OBST for above values using dynamic approach. **10**

b) Write a short note on dynamic approach for multistage graph. **6**

OR

6. a) Explain the travelling salesman problem as dynamic programming algorithmic strategy. Discuss the time and space complexities. Find out the solution for following example. **10**

	City 1	City 2	City 3	City 4
Pers 1	0	10	15	20
Pers 2	5	0	9	10
Pers 3	6	13	0	12
Pers 4	8	8	9	0

b) What is the principle of optimality in dynamic programming ? How do we ensure that it holds for the any given problem ? **6**

SECTION – II

7. a) Consider the backtracking solution to the following instance of 0/1 knapsack problem. The capacity of knapsack is C = 15. **12**

i	0	1	2	3	4	5	6
Vi	25	45	12	7	6	10	5
Wi	5	11	3	2	2	7	4

Draw the variable tuple state space tree.

b) Show that the number of nodes of both the fixed tuple and variable tuple. State space trees for sum of subset problem are exponential in "n". **6**

OR

8. a) Using backtracking solve the problem : **12**

Suppose you are given n men and n women and two n*n arrays P and Q such that P(i, j) is the preference of man i for women j and Q (i, j) is the preference of women i for man j. Give and algorithm that finds a pairing of men and women such that the sum of the product is maximized.

b) Discuss and analyze the problem of finding Hamiltonian cycle using backtracking. **6**

9. a) Describe following with suitable example with respect to branch and bound : **10**

i) The method
ii) LC search
iii) Control abstraction for LC search
iv) Bounding

b) Differentiate between backtracking and branch and bound. Illustrate with example of 4-Queens problem. **6**

OR

10. Explain the 0/1 knapsack problem and explain the following with respect to 0/1 knapsack problem. **16**

1) state space tree
2) solution state
3) state space
4) answer state
5) static tree
6) dynamic tree
7) live node
8) bounding function

11. a) What do you mean by polynomial problem, NP hard problem and NP complete problem ? Give the suitable example of each of the category of problem. **8**

b) Prove that "The set of real numbers, R is not countable". **4**

c) Show that any subset of a countable set is countable. **4**

OR

12. a) Show that both P and NP are closed under the operation union, intersection, concatenation. **8**

b) What is cook theorem ? How can it be used to establish whether P = NP or P $\neq$ NP ? **8**

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