**B.E.(Computer Engineering) Examination, May-2014**
**Design and Analysis of Algorithms**
**(2003 course)**

**Time : Three Hours** **Maximum Marks : 100**

N.B. : (1) Answer three questions from each section.
(2) Answer 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**

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| Q.1(a) | What are the asymptotic notations? What is significance of asymptotic notation in analyzing algorithms? Explain these notations for selection sort algorithm. | (10) |
| Q.1(b) | Solve the following recurrence using recurrence relation<br>$t_n = n$ ..... if n=0,1<br>$= 2t_{n-1} - 2\ t_{n-2}$ ..... otherwise | (06) |
| | **OR** | |
| Q.2 (a) | What is time complexity of an algorithm? How do we represent it using Big-Oh( O) notation? Write any algorithm to solve same problem in different ways so that they have different time complexities. | (12) |
| Q.2 (b) | How do we analyze the algorithm if it contains<br>(i) for loop<br>(ii) while loop | (04) |
| Q.3 (a) | Some friends of your work on wireless networks, and they are currently studying the properties of network of n mobile devices. As the devices move around, they define a graph of any point in time as follows: there is node representing each of the 'n' devices, and there is an edge between device i and j if the physical locations of i and j are no more than 500 meters apart.<br>They had like it to be the case that the network of devices is connected at all times and so they have constrained the motion of devices to satisfy the property : at all times, each device i is within 500 meters of at least n/2 of the other devices (assume n is an even number)<br>In other word the property is " Let G be a graph on n nodes, where n is an even number. If every node of G has degree at least n/2, then G is connected"<br>(i) does this property by itself guarantee that the network will remain connected? | (10) |

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| | (ii) Decide whether you think claim is true or false?<br>(iii)Give a proof of either claim or its negation | |
| Q.3<br>(b) | What is divide and conquer strategy for algorithmic design? Give an example which can be solved with and without divide and conquer strategy? And give the advantages and disadvantages of divide and conquer strategy. | (08) |
| | **OR** | |
| Q.4 (a) | Trace the action of binary search algorithm, including listing the value of Low, High and Mid after each iteration, for the list {2,4,5,7,15,16,17,19,23,29,35,37} for each of the following search elements ( show the binary tree for these search)<br>(i) X = 3<br>(ii) X = 35<br>(iii)X = 108<br>(iv)X=17<br>(v) X = 37 | (10) |
| Q.4<br>(b) | Design and analyze a divide and conquer algorithm for finding the maximum and minimum number in an array that uses $\lceil 3n/2 \rceil - 2$ comparison for any n – number of elements | (08) |
| Q.5 (a) | Trace the action of Huffman coding algorithms using greedy method for the letters {if,but,cry,do,else,for,go,home} occurring with frequencies {15,17,3,50,19,12,3,2} | (08) |
| Q.5<br>(b) | Explain How Greedy strategy is applied in minimum spanning tree problem? Analyze the Prim's algorithm using greedy algorithm | (08) |
| | **OR** | |
| Q.6(a) | Demonstrate the action of bubble sort and selection sort on the given array a[ ]= {33,2,56,23,55,78,2,98,61,108,14,60,56,77,5,3,1},<br>For the above data, how many number of comparisons are needed in bubble sort and selection sort ? | (10) |
| Q.6<br>(b) | Compare between the analysis of the Quick sort and Merge Sort? And tell which algorithms is better when? | (06) |

## Section - II

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| Q.7(a) | N = 4 and {a1, a2, a3,a4}= {count, float, if, while} Let p (1:4) = (0.05,0.2,0.1,0.05) q(0:4) = (0.2,0.2,0.2,0.05,0.05) Compute and construct OBST for above values using Dynamic approach | (12) |
| Q.7(b) | What is principle of optimality in dynamic programming? Write any three points of comparison between dynamic programming, greedy approach and divide & conquer approach to solve the problem. | (06) |
| | **OR** | |
| Q.8 (a) | Explain the difference between fractional knapsack and 0/1 knapsack problems. Does the same programming technique work for both the problems? Justify with example in detail | (12) |
| Q.8 (b) | What is principle of optimality? Which algorithmic strategy use this principle? Explain with suitable example. | (06) |
| Q.9 (a) | Draw a state space tree for 8-queen problem and with respect to state space tree drawn above explain the following terms :<br>(i) solution states<br>(ii)state space<br>(iii)answer states<br>(iv)static trees<br>(v)dynamic trees | (08) |
| Q.9(b) | Consider the following instance for knapsack problem using backtracking n=8<br>P = (11,21,31,33,43,53,55,65) W = (1,11,21,23,33,43,45,55) M =110 | (08) |