DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
FIRST SESSIONAL
SUBJECT: (IT 509) Design And Analysis of Algorithm

Examination	: B.TECH Semester - V	**Seat No.**	:
Date	: 28/07/2015	**Day**	: Tuesday
Time	: 11:15 to 12:30	**Max. Marks**	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed.

   (a) Determine the asymptotic complexity of the following recurrence relation with T(1) = 1? **[2]**
   $T(n) = 2\ T(n/2) + n^{0.5} (\log n)^2$ using Master Theorem.

   (b) Prove the asymptotic relation between $f(n)=2^n$ and $g(n)=n\log(n)$ using limit rule **[2]**

   (c) What precautions are needed to get asymptotic complexity of O(n (lg n)) for Quick sort **[2]**
   algorithm?

   (d) Find the complexity of following pseudo-code **[2]**
   *for(i=1; i<=n; i=i*2)*
    printf("Algorithm Analysis");

   (e) Describe the properties of Algorithm. **[2]**

   (f) What is difference between prior and posterior analysis? **[2]**

Q.2 Attempt *Any TWO* of the following questions. **[12]**

   (a) Explain the Radom Access Model and its importance in prior analysis of algorithm.

   (b) Write the Insertion sort algorithm and find the best case as well as worst case complexity using frequency count method

   (c) Algorithm CHECKSUMS (A, x)
   Input: An array A and a value x.
   Output: A boolean value indicating if there is two elements in A whose sum is x.
   A ← MERGE-SORT (A)
   n ← length[A]
   for i ←1 to n do
       if A [i] >= 0 and BINARY-SEARCH (A, A [i] − x) then
           return true
       end if
   end for
   return false
   Find the time complexity of CHECKSUMS using frequency count method.

Q.3 (a) Discuss and analyze algorithm that finds the maximum element from the array using Divide **[6]**
   and Conquer method. Write recurrence equation for the algorithm and find the complexity using recurrence tree method.

   (b) Sort the following element using Merge Sort and Quick sort (by taking median as pivot **[6]**
   element)
   4, 8, 9, 10, 5, 3, 1, 2, 7, 6

OR

Q.3 (a) Consider variation of the binary search algorithm so that it splits the input into three sets of **[6]**
   almost equal sizes. Write down the recurrence equation for this search algorithm and find the asymptotic complexity of this algorithm using recurrence tree method.

   (b) Explain selection algorithm using divide and conquer, which selects k^{th} smallest element from **[6]**
   array of size N with example. Find its asymptotic complexity.