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	**: 04/08/2017**	**Day**	**: Friday**
Time	**: 11:30 to 12:45**	**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) Find the time complexity (big 'O') of following code. Assume that A is an array of n integers **[2]**

```
j<-0
for i<-0 to n
  while(j<n and A(i) <A(j))
      j<- j+1
  end
end
```

(b) Prove the asymptotic relation between $f(n)=2^n$ and $g(n)= n^{\sqrt{n}}$ **[2]**

(c) What is asymptotic analysis? Sort the following function in increasing order of growth rate **[2]**
1) $n^{0.99999}\log n$ 2) $1000000\,n$ 3) 1.00001^n 4) n^2

(d) Explain the difference between multi-value and multi-solution problems with suitable example **[2]**

(e) What are the properties of computer algorithm? Explain each in brief **[2]**

(f) What is the difference between Divide and Conquer and Dynamic Programming? Discuss pros and cons of each method **[2]**

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

(a) Consider the following algorithm and describe the design technique it is based on. Also, find the recurrence equation and solve it using suitable techniques

```
Algorithm Tower(n,a,b,c)
  If (n==1)
     Print move disc from a to c
     return
  else
     Tower(n-1,a,c,b)
     Print move disc from a to c
     Tower(n-1,b,a,c)
End
```

(b) Solve following recurrence using recurrence tree method

$$T(n)=T\left(\frac{n}{3}\right)+T\left(\frac{2n}{3}\right)+n$$

(c) Solve following recurrence using back substitution method

$$T(n)=\begin{cases}1 & when\, n=0\\ n*T(n-1)+n & otherwise\end{cases}$$

Q.3 (a) Discuss and Strassen Matrix multiplication and show how it improves performance over conventional matrix multiplication. **[8]**

(b) Discuss the Random Access Model of computing machine **[4]**

OR

Q.3 (a) Write a variation of the binary search algorithm so that every time it splits the input into three sets of almost equal sizes. Also, state whether it is better than the conventional binary search algorithm in term of time complexity. **[6]**

(b) Explain best case and worst case behavior of Quick Sort algorithm. Also, suggest how to make sure O(*nlogn*) complexity for Quick sort algorithm? **[6]**