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## TCS-502/TIT-502

**B. Tech. (CS/IT) (Fifth Semester)**  
**Mid Semester EXAMINATION, 2017**  
**DESIGN AND ANALYSIS OF ALGORITHMS**

*Time : 1:30 Hours ]*

*[ Maximum Marks : 50*

- Note :** (i) This question paper contains two Sections.  
(ii) Both Sections are compulsory.

### Section—A

1. Write True/False : (1×5=5 Marks)
  - (a) Time complexity of quick sort when array is reversely sorted  $\Theta(\quad)$ .
  - (b) If  $T(n) = 27T(n/9) + n \cdot \lg n$  then  $T(n) = \Theta(\quad)$
  - (c) If  $T(n) = 2 \cdot n^2 + \lg n^n + 8^{\lg n}$  then  $T(n) = \Theta(\quad)$
  - (d) Selection sort is best algorithm when array is already sorted. (True/False)
  - (e) Divide and conquer method follows recursive approach. (True/False)
2. Attempt any *five* parts : (3×5=15 Marks)
  - (a) Define Algorithm. Write down its property.

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- (b) Give the time complexity of Brute Force String matching in best, Average and worst case.
- (c) Differentiate between max Heap and min Heap with example.
- (d) Solve  $T(n) = T(n-1) + c$  when  $n > 1$  and  $T(n) = c$  when  $n = 1$ .
- (e) Design bubble sort algorithm such that best case time complexity is  $\Theta(n)$ .
- (f) Derive run time complexity of Merge Sort.

**Section—B**

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

- (a) Solve  $T(n) = 4T(n/2) + n$  assume  $T(1) = 1$  using recursion tree method.
- (b) Find out run time complexity of following code :

```
for(i = 1 ; i < n ; i++)
{
    for(j = n ; j > i ; j--)
    {
        a[i] = a[j] * a[i];
    }
    n--;
}
```

- (c) Explain asymptotic notation with the help of example.

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4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

- (a) Solve the recurrence using Masters Method :

(i)  $T(n) = 2T(n/4) + n^{1/2}$

(ii)  $T(n) = 8T(n/4) + n \cdot \lg n$

- (b) Design the algorithm of Insertion Sort for sorting numbers in the decreasing order and derive the Time complexity for BEST Case.
- (c) Give Solution for following fractional-knapsack problem (knapsack Size = 72). If it is fractional knapsack then what is the solution ?

Item	Cost	Weight
1	20	40
2	50	30
3	70	30
4	15	20

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

- (a) Apply Heap Sort on the following sequence to sort and show intermediate steps :

16	4	10	14	7	9	3	2	8	1
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- (b) Derive the run time complexity for Quick sort for Best Case and Worst Case.

(c) Illustrate activity selection problem for following set of activities :

Activities	Si	Fi
a	1	2
b	3	4
c	2	5
d	5	7
e	6	8
f	6	12
g	7	15
h	9	11
i	8	15
j	10	13
k	9	17