COURSE NAME: FUNDAMENTALS OF ALGORITHMS   MAX. MARKS: 50
COURSE CODE:10B11CI411
COURSE CREDITS: 3   MAX. TIME: 2 Hr

Note: All questions are compulsory. Carrying of a mobile phone during examinations will be treated as a case of unfair means.

Question 1:   [4+4 Marks]
  a. You have to sort 1 GB of data with only 100 MB of available main memory. Which sorting technique will be most appropriate, what will be its worst case complexity?
  b. Suppose we have a O(n) time algorithm that finds median of an unsorted array. Now consider a QuickSort implementation where we first find median using the above algorithm, then use median as pivot. What will be the worst case time complexity of this modified QuickSort.

Question 2: Find the complexity of following codes   [3+9 Marks]
a

  1. *for (int i = 2; i <=n; i = pow(i, c)) { // Here c is a constant greater than 1*
  2. *// some O(1) expressions }*
  3. *for (int i = n; i > 0; i = fun(i)) {   //Here fun is sqrt*
  4. *// some O(1) expressions }*

  b.   Find the complexity of : $T(n) = T(n/4) + T(n/2) + cn^2$ using a) Back substitution b)Masters Theorem c) Recurrence Tree Method

Question 3:   [12+6 Marks]
  a. Write the algorithm for Fibonacci numbers (0, 1, 1, 2, 3, 5, 8 ...) using a) Divide and conquer and b) Dynamic programming. Write space and time complexity in both approaches?
  b. Use branch and Bound Technique to solve 0/1 knapsack problem where the knapsack size is 15 and

items	1	2	3	4
Profit	10	10	12	18
Weight	2	4	6	9

Question 4:   [6+3+3 Marks]

  a) Write the algorithm for TSP using greedy approach. Write its space and time complexity.
  b) What are different proving techniques
  c) Define P, NP, NPC and NP-Hard.