POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

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Jaypee Institute of Information Technology, Noida

T1 Examination, 2015

B.Tech IV Semester

Course Title: Fundamentals of Algorithms **Maximum Time : 1 hour**

Course Code: 10B11CI411 **Maximum Marks : 20**

Q1: **[6 Marks]** A small investment company deals with following problem: They are doing a simulation in which they look at n consecutive days of a given stock, at some point in the past. Lets number the days i=1,2,…n; for each day ***i***, they have a price ***p[i]*** per share for the stock on that day. (for simplicity we will assume the price was fixed during each day.) Suppose during this time period, they wanted to buy 1000 shares on some day and sell all these shares on some (later) day. They want to know: When should they have bought and when should they have sold in order to make as much money as possible? (if there was no way to make money during the n days, you should report this instead. For example:

Day i	1	2	3	4	5	6
Price p[i]	14	2	1	4	9	7

Then answer should be "buy on day 3, sell on day 5. profit is 8*1000=8000". Propose an efficient algorithm to solve above problem. Also, state the complexity of the proposed solution.

Q2:(a) **[3 Marks]** Find the recurrence for the following algorithm. Also, calculate worst case time complexity by solving the recurrence.

```
bool Algo(int set[], int n, int sum)
{  if (sum == 0)
     return true;
   if (n == 0 && sum != 0)
     return false;
   if (set[n-1] > sum)
     return Algo(set, n-1, sum);
   else
     return Algo(set, n-1, sum) ||
                 Algo(set, n-1, sum-set[n-1]);
}
```

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(b) **[3 Marks]** Solve the given recurrence relation: $T(n) = T(n-2) + 2\log_2 n; \quad T(0) = T(1) = 1$

(c) **[2 Marks]** Assume that $f(n)$, $g(n)$ and $h(n)$ are positive functions. Prove that

$$O(f(n) + g(n) + h(n)) = O(max(f(n), g(n), h(n)).$$

Q3: **[6 Marks]** Show the result of inserting the following keys in an empty AVL tree (in sequence).

15, 18, 12, 8, 54, 5, 14, 13, 9

After insertion of all the elements, delete 54, 12 and 9 in sequence.