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Data Structure I

SOLVE EXACTLY THREE OUT OF THE FOLLOWING FIVE
PROBLEMS:

- (a) Show the result of inserting 3, 1, 4, 6, 9, 2, 5, 7 into an initially empty binary tree.

(b) Show the result of the above tree deleting the root.
- (a) What does the following program segment calculate?

```
public static int MS (int [ ] a)
{
    int MS = 0, TS = 0;
    for (int j = 0; j < a. length; j++)
    {
        TS = TS + a[j];
        if (TS > MS)
            MS = TS;
        else if (TS < 0)
            TS = 0;
    }
    return MS;
}
```

- (b) What is the running time of the above program if $n = a. \text{length}$?

3. Give an algorithm to compute a^n in $O(\log n)$ time. Where a is an integer.

4. (a) Give a flow chart of the algorithm of Insertion Sort.

(b) Prove that the running time of insertion sort is $O(n^2)$.

5. $\frac{a}{x-y} + \frac{12-12}{14+8}$

Consider the following procedure in C or in Java in which A represent a global variable of integer types void F (int B , int C)

```
{
    int i;
    A = 1;
    if (B >= 0)
    {
        A = A * C
        for (i = 0; i < C; i++)
            F(B - 1, C)
    }
}
```

(a) Draw the recursion tree corresponding to the execution of $F(2, 3)$.

(b) Determine the value A in term of x and y after the following instructions being executed.

$A = 1$
 $F(x, y)$