SOLVE EXACTLY THREE OUT OF THE FOLLOWING FIVE PROBLEMS:

1. (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.

2. (a) What does the following program segment calculate?

   ```java
   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 $n = a$. 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 $C$)

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

(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.

\[
A = 1 \\
F(x, y)
\]