



**KEEPING MOBILE PHONE/SMART WATCH, EVEN IN "OFF" POSITION IS TREATED AS EXAM MALPRACTICE**

**General Instruction: Draw diagrams wherever necessary.**

**Answer ALL Questions**

**(10 X 10 = 100 Marks)**

1. a) The following piece of code determines whether all the elements in a given [3]  
array are distinct. Assume it takes an array A [0...n - 1] as input and returns  
"true" if all the elements in A are distinct and "false" otherwise.

```
for i ← 0 to n - 2 do  
  for j ← i + 1 to n - 1 do  
    if A[i] == A[j] return false  
return true
```

Identify the operation and calculate the worst case time complexity of this algorithm.

- b) Write an algorithm to solve the following puzzle. Derive a recurrence relation [7]  
for the algorithm and analyze the time complexity of the algorithm using  
back substitution method.

Consider three rods and N disks of various diameters, which can slide onto any rod. The puzzle begins with the disks stacked on one rod in the order of decreasing size, the smallest at the top, thus approximating a conical shape. The objective of the puzzle is to move the entire disks to the last rod, obeying the following rules:

1. Only one disk may be moved at a time.
2. Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack or on an empty rod.
3. No disk may be placed on top of a disk that is smaller than it.

2. a) Consider the expression:  $(5 * (4 + 6)) * (4 + 9 / 3)$ . Write a suitable algorithm that [5]  
makes use of stack to convert it to a postfix expression. Apply your algorithm  
to convert the given expression to postfix. (Note: Step by step conversion  
should be demonstrated).