Assignment-3

Ans-1)

A) Here a basic recursion is developed, as per constraints if a single red ball occurs then we mark the flag as true, and in the next step of the recursion we place a blue ball. Then if we place a blue ball we have two options, placing a blue or a red ball and decrease the count of remaining blue or red balls.

(1) **Recurrence relation – T(r,b) = T(r,b-1) + T(r-1,b-1)**

(2) The relation is based on the fact that we can choose a blue ball or Choose a red ball and then we have to choose a blue ball after that. Printing the array costs (r+b) at the end each time.

The time complexity upper bound will be roughly **$O((r+b) . 2^b)$.**

B) Same concept is used as that of part(A), instead of marking flag as true or false, we increment the value of flag by 1 each time we put a red ball. If (flag==2) that means 2 consecutive red balls are placed and then we have to place a blue ball after that.

Ans-2) Here, we used a similar recursion again where the starting index of the array is initialized to 1, then we have to choices for the next element, either set the same value as previous one or set the next value 1 greater than the previous element. If the value reaches k then we set all elements after that equal to k.

Recurrence relation – T(n,k) = T(n-1,k) + T(n-1,k-1)

This is based on the fact that iterating backward each time the index decreases by 1, and the value of k can be the same or decreased by 1.

Time Complexity – $O(n.2^n)$

The solution is based from the solution to same recurrence relation as in **Ans-1.**