CSE 321 HW4

Q2) In this question, I used Quick Select algorithm because it is a decrease and conquer algortihm.It finds kth smallest element on the list.I want to find median, so my number must be in the middle of the array.So I take position to arraylength/2 because my middle element is on that position.In Quick Select, worst case occurs when we pick biggest or smallest element as pivot in the array. 10,30,40,20,15 if we take first element as pivot, then it splitys array [30,40,20,15] then [40,20,15] then [20,15] this operation done repedeately until the end of the array.So time complexity becomes: T(n) = T(n-1)+ cn = T(n-1)+T(n-2)+ c(n)+c(n-1) it continues until end of array. So the complexity is O(n^2).

Q3) a) Firstly I created a circular linked list. Then with this code survivor = (survivor + 2) % i I founded position of the survivor.In this 2 represents how many player is skipping before selecting next survivor.2 next player is dead and next turn is on the next player's next.Every player can kill 1 player so the value must be 2.Then when we found position of winner, go next on temp linked list until iterate the winner position.Then we found winner.Time complexity of this algorithm is equal to O(n) because there are 2 for loops and they both work in O(n) time.

b) In this part, firstly we must found position of winner. We found minimum power of 2 that is smaller than count of players in circle. We used value of 2 * n is used because it represents the total number of people in the circle, including those that have been eliminated. The value of playersIncludedWithDeads, which represents the number of people that have been eliminated, is then subtracted from 2 * n to get the position of the survivor. It always takes uses power of two for calculating playersIncludedWithDeads.So the time comlexity is equal to O(log n) (base 2).

Q4) The time complexity of an algorithm refers to the amount of time it takes for the algorithm to complete its task.

If we looking a person's number in a phone book, we can find the phone number by picking a random point about halfway through the part of the book we haven't searched yet, then checking if the person's name is at that point. Then repeat the process about halfway through the part of the book where the person's name. This is how binary search Works on real life. Let's assume we hae 60 page book. If we search name eerty time splitting the book half we have to search 2 part of the book. But if we split the book 3 part, so we must search all of three parts of the book.So in this case splitting three takes much more time.

The divisor in the which has logn(a) (base n) time complexity of a search algorithm, n refers to the number of times the search space is divided at each step.If the array size n and we split array to n part, time complexity become logn(n) (base n).And which is equal to 1.So time complexity become O(1).

Q5) 1) For best case scenario of interpolation search, the element being searched for is found on the first try.In this case time complexity is O(1).

2) Binary search repeatedly divides the array that is searched in half and comparing the target element with the element at the midpoint of the search space.If the.If the target element is greater than midpoint, than array shrinks to right of the midpoint.If the searched element is lower than midpoint, than arrays shrinks to left of midpoint .On the other hand, Interpolation Search may go to different locations according to search-key. If the value of the search-key is close to the last element, Interpolation Search is likely to start search toward the end side.This algorithm uses this formula:

index = low + (target - arr[low])*(high - low) / (arr[high] - arr[low])

They both have same average-time complexity that is O(log(log n)) but in worst case, binary search is O(log(n)) on the contrary, interpolation search has O(n) time complexity.But in average case, if array is sorted, interpolation search shows better performance than binary search.But If array is like 1,1000,100000 that, in this situation interpolation search not work properly.