CS315: Design and Analysis of Algorithms (2020/21)
Tutorial 01

Submit solutions as a soft copy (scanned with a software such as CamScanner) on or before 29th July, 2022 11.59pm.
Note: Only handwritten answers are accepted.

1. Order the following time complexity functions by their growth rate.

   37, $2^{N/2}$, $N^2 \log N$, $N \log\log N$, N^3

2. List the steps of the theoretical approach to calculate the time complexity analysis of an algorithm.

3. Outline the steps of an algorithm to find the intersection of two sorted integer arrays and provide an implementation in python. For example, two arrays are {1, 3, 4, 5, 7} and {2, 3, 5, 6}, the intersection is {3, 5}.

4. Determine the time complexity functions and write the Big O values of the following code segments.

   a)
```
def func1(n):
    sum = 0
    i=1
    for  k in range(0,n,2*i):
            sum=sum+1
            i*=2
    return sum
```

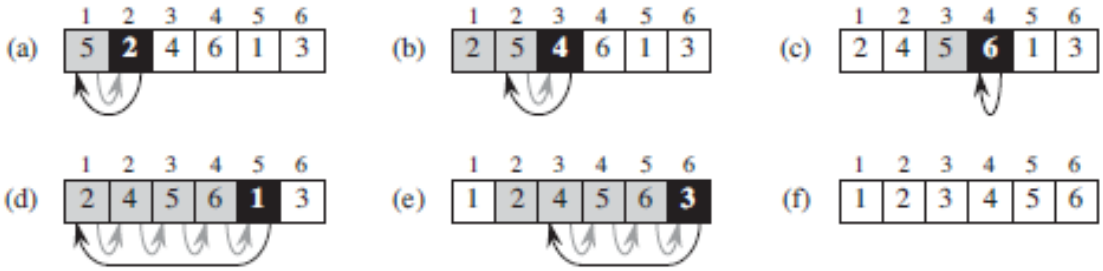
   b)
```
def func2(n):
    sum = 0;
    for  i in range(0,n):
        for j in range(0,i^2):
            for k in range(0,j):
                sum=sum+1
     return sum
```

   c)
```
def func3(r,n):
    sum = 0;
    for  i in range(0,n):
        for j in range(0,r):
            sum=sum+1
    return sum
```

5. Write the Big O value of the following time complexity functions.
   a) $T(n) = n^2 + 42n + 7$
   b) $T(n)=5n \log n + 8n - 200$
   c) $T(n) = 500n + 100n^{1.5} + 50n \log_{10} n$
   d) $T(n) = 2^n + n \log n + 5$
   e) $T(n) = 0.01n \log n + n(\log n)^2$

6. Calculate *c* and n_0 of time complexity functions in **5 b) and 5 c).**

7. Using a figure like the one given below, illustrate the operation of insertion sort on the input [31,41,59,26,41,58].



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