UNIVERSITY OF MANAGEMENT & TECHNOLOGY, LAHORE CAMPUS

SST, Department of Computing (CS)

Quiz# 1 – Theory Paper: AOA V4

Instructor: Rana Marwat Hussain

Name # _____ SID #_____ Signature#_____

Total Time Allowed: 20 Mins

Total Marks: 10

Note: (A) Attempt all Questions.

(B) Write only in the Given Space no extra sheet or any other material will be allowed/given.

(C) Each question contains different marks as shown on the label.

(D) Cutting/rewriting/overwriting will not accept especially in output questions. Please avoid it.

(E) Time for completing each section is mentioned separately.

Q1. Attempt all the output questions and write their output in the given box only no extra sheet available.

a) **Compute time Complexity of the code snippet:**

```
int i,b,v,o;
char a,e,r;
cin>>i>>b>>v>>o;
cout<<"rana marwat hussain"<<endl;
for(int l=0;l<N;l++)
{
 for(int i=0;i<N;i++)
 {
        cout<<"a";

 }
 for(int j=0;j<N;j++)
 {
   cout<<"a";
 }
 for(int k=0;k<N;K++)
 {

  cout<<"a";
 }
}
```

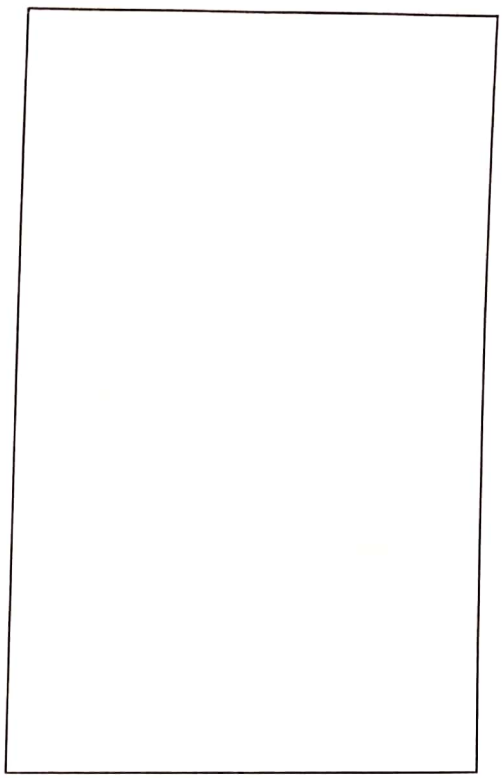
b) Compute time Complexity of the code snippet:

Suppose we have N size of Arrays.

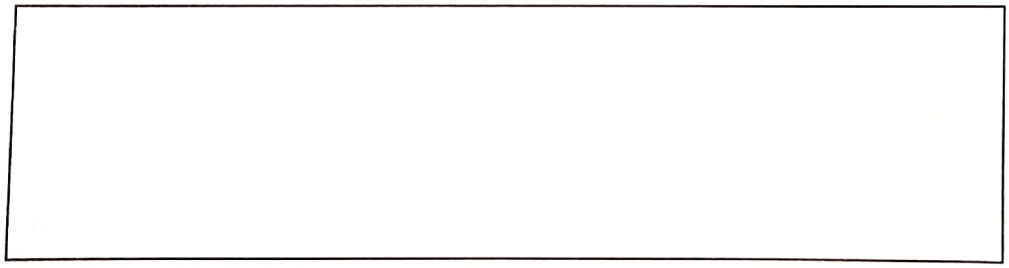
```
get (arr, x, low, high)
    repeat till low = high
        mid = (low + high)/2
        if (x == arr[mid])
        return mid

        else if (x > arr[mid]) // x is on the right side
          low = mid + 1

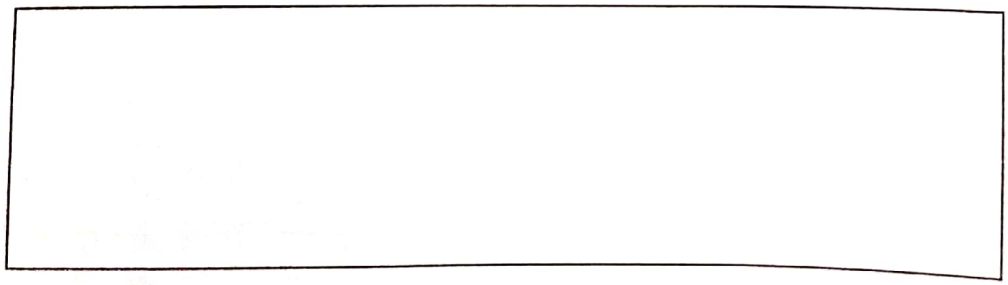
        else            // x is on the left side
          high = mid - 1
```



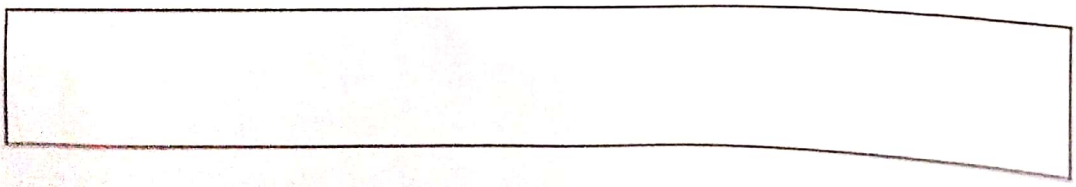
c) Find upper bound of running time of constant function f(n) = 6993. Find C & N_0



d) Find upper bound of running time of constant function $f(n) = 2n^2 + 5n^3+6n+ 4-5$ C & N_0



e) Find lower bound of running time of constant function $f(n) = 2n^2 + 5n^3+6n+ 4-5$ C & N_0



UNIVERSITY OF MANAGEMENT & TECHNOLOGY, LAHORE CAMPUS

SST, Department of Computing (CS)

Quiz# 1 – Theory Paper: AOA V4

Instructor: Rana Marwat Hussain

Name # Mubarram Nawaz SID # F2020266119 Signature# _____

Total Marks: 10 **Total Time Allowed: 20 Mins**

Note: (A) Attempt all Questions.

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Q1. Attempt all the output questions and write their output in the given box only no extra sheet available.

a) Compute time Complexity of the code snippet:

```
int i,b,v,o;
char a,e,r;
cin>>i>>b>>v>>o;
cout<<"rana marwat hussain"<<endl;
for(int l=0;l<N;l++)
{
 for(int i=0;i<N;i++)
 {
        cout<<"a";

 }
 for(int j=0;j<N;j++)
 {
  cout<<"a";
 }
 for(int k=0;k<N;K++)
 {

  cout<<"a";
 }
}
```

$1+1+1+1+1+n+\frac{n(n+1)}{2}$

$+n+\frac{n(n+1)}{2}+n+\frac{n(n+1)}{2}$

$+n$

$5+4n+3\left(\frac{n(n+1)}{2}\right)$

$NO = n^2$

8

b) Compute time Complexity of the code snippet:

Suppose we have N size of Arrays.

```
get (arr, x, low, high)
    repeat till low = high
        mid = (low + high)/2
        if (x == arr[mid])
        return mid

        else if (x > arr[mid]) // x is on the right side
          low = mid + 1

        else            // x is on the left side
          high = mid - 1
```

$n + 1 + 1 + 1$

9

c) Find upper bound of running time of constant function f(n) = 6993. Find C & N_0

$f(n) \leq c \cdot (g(\theta))$

$f(n) \leq 6993 \cdot (1)$

$N_0 = 1$

$C = 6993$

d) Find upper bound of running time of ~~constant~~ function $f(n) = 2n^2 + 5n^3 + 6n + 4 - 5$ C & N_0

$f(n) \leq c \cdot g(o)$

$f(n) \leq 12 \cdot (n^3)$

$N_0 > n^3$

$C = 12$

e) Find lower bound of running time of ~~constant~~ function $f(n) = 2n^2 + 5n^3 + 6n + 4 - 5$ C & N_0

$f(n) \geq c \cdot (g(\theta))$

$f(n) \geq 1 \cdot (n)$

$C = 1$

$N_0 = n$

UNIVERSITY OF MANAGEMENT & TECHNOLOGY, LAHORE CAMPUS

SST, Department of Computing (CS)

Quiz# 1 – Theory Paper: AOA V4

Instructor: Rana Marwat Hussain

Name # M. Zohi SID # F2020260125 Signature# _____

F2020260125

Total Marks: 10 **Total Time Allowed: 20 Mins**

Note: (A) Attempt all Questions.

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Q1. Attempt all the output questions and write their output in the given box only no extra sheet available.

a) Compute time Complexity of the code snippet:

```
int i,b,v,o;
char a,e,r;
cin>>i>>b>>v>>o;
cout<<"rana marwat hussain"<<endl;
for(int l=0;l<N;l++)
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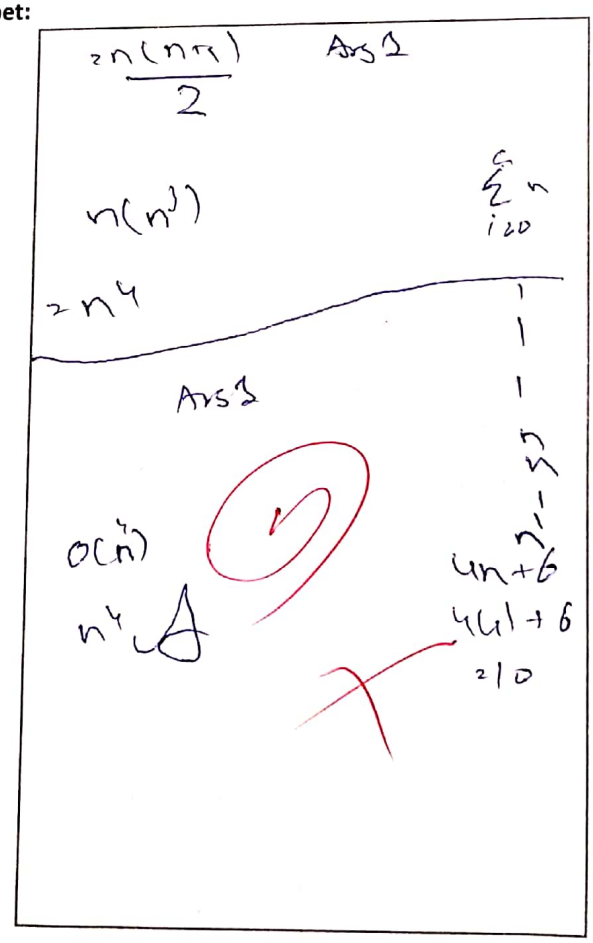
 for(int i=0;i<N;i++)
 {
        cout<<"a";
 }
for(int j=0;j<N;j++)
{
 cout<<"a";
}
for(int k=0;k<N;K++)
{
 cout<<"a";
}
}
```



$\frac{n(n+1)}{2} + \frac{n^2(n+1)}{4}$

$\frac{n^2+n}{2} + \frac{n^3+n}{4}$

$4n^2+4n+2n^3+2n$

$4n^2+2n^3+6n$

$2n(2n^2+n^2+3)$

n^2+2n+3

b) **Compute time Complexity of the code snippet:**

Suppose we have N size of Arrays.

```
get (arr, x, low, high)
    repeat till low = high
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        if (x == arr[mid])
        return mid

        else if (x > arr[mid]) // x is on the right side
            low = mid + 1

        else            // x is on the left side
            high = mid - 1
```

$\frac{n(n+1)}{2} + \frac{n^2(n+1)(n+1)}{c_1} + \dots$

$\sum_{i=0}^{n} n$

$= n^2$

c) Find upper bound of running time of constant function f(n) = 6993. Find C & N_0

$f(n) \le cg(n)$

$f(n) = 6993$

$c = ?$

$f(n) = 6993 \le c(gn)$

$6993 \le c(n_0)$ $c=1$

$6993 \le 6993n_0(n_0)$

$6993 \le 6993(1)(n_0)$

$c = 6993$

$c(g(n_0))$ n_0

n^3

$12n_0$

$2(1)^2+5(1)^2+6(1)$

$+4+.$

$12 = 12n_0$

d) Find upper bound of running time of constant function f(n) = $2n^2 + 5n^3+6n+$ ~~4~~5 C & N_0

$f \le cg(n)$ $c=12$

put $n=1$

$f(1) = 2n^2+5n^3+6n \le cn_0$

$2n^2+5n^3+6n = cn_0$

$2(1)^2+5(1)^3+6(1) = 13n_0$

$13 = 13$

$f(n) \le c(g(n))$

$= n_0$

$2(2)^2+5(2)^3+6(2)-1$

$8+40+12-1$

$13 = 13$

$2n^2+5n^3+6n = 12n_0^2$

$6(1) = 30(1)$

$6 = 6$

e) Find lower bound of running time of constant function f(n) = $2n^2 + 5n^3+6n+$ ~~4~~5 C & N_0

$2n^2+5n^3+6n = 13(n_0)$

$2(1)^2+5(1)^3+6(1) = 13(1)(n_0)$

$13 = 13n_0$

$c(g(n_0))$

n_0

UNIVERSITY OF MANAGEMENT & TECHNOLOGY, LAHORE CAMPUS

SST, Department of Computing (CS)

Quiz# 1 – Theory Paper: AOA V4

Instructor: Rana Marwat Hussain

Name # UMAR INAM SID # F2019266271 Signature# Umar

Total Marks: 10 **Total Time Allowed: 20 Mins**

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 for(int i=0;i<N;i++)
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        cout<<"a";

 }
 for(int j=0;j<N;j++)
 {
  cout<<"a";
 }
 for(int k=0;k<N;K++)
 {

  cout<<"a";
 }
}
```

n(n+n+n)

1(4)

4

4

aaaaaa 4a

5

b) Compute time Complexity of the code snippet:

Suppose we have N size of Arrays.

```
get (arr, x, low, high)
    repeat till low = high
        mid = (low + high)/2
        if (x == arr[mid])
        return mid

        else if (x > arr[mid]) // x is on the right side
            low = mid + 1

        else            // x is on the left side
            high = mid - 1
```

O(n)

7(n)

9

c) Find upper bound of running time of constant function f(n) = 6993. Find C & N_0

C = 6991

9

d) Find upper bound of running time of ~~constant~~ function $f(n) = 2n^2 + 5n^3+6n+ 4-5$ C & N_0

$5n^3+2n^2+6n+4-5$ | $5n^3+2n+6-1$

$5n^3+2n^2+6n-1$

$5n^3+2n^2+6n-1$

$5n^3+n(2n+6)-1)$

9

$\rightarrow 5n^3+2n^2+6n$

e) Find lower bound of running time of ~~constant~~ function $f(n) = 2n^2 + 5n^3+6n+ 4-5$ C & N_0

$2n^2+5n^3+6n+4-5$ | $5n^3+2n^2+6n-1$

$2n^2+5n^3+6n+(-1)$

$2n^2+5n^3+6n-1$