



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 l=0;l<N;l++)
    {
        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

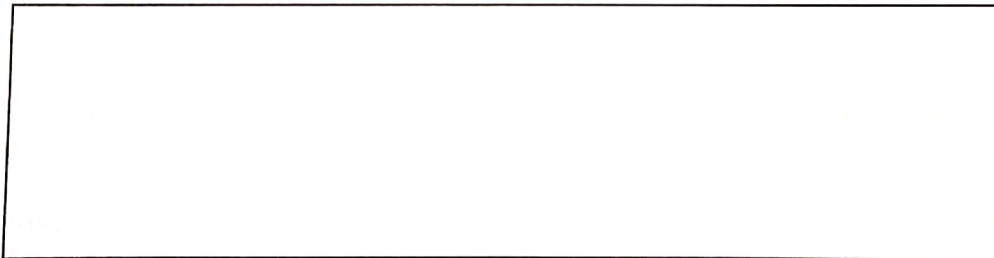
else if (x > arr[mid]) // x is on the right side

low = mid + 1

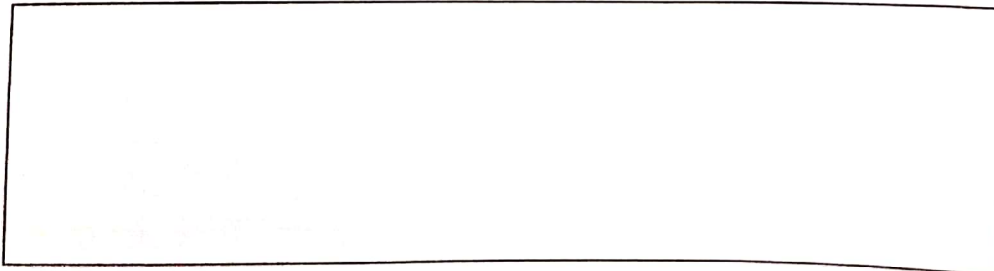
else // x is on the left side

high = mid - 1

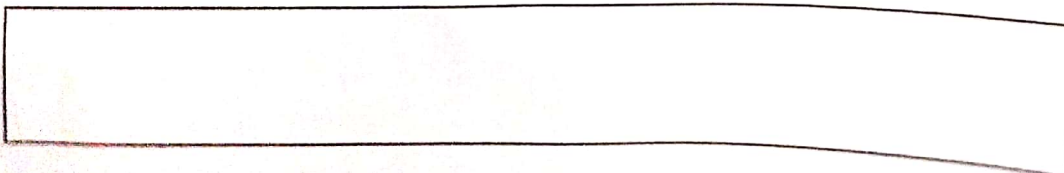
**c) Find upper bound of running time of constant function  $f(n) = 6993$ . Find C &  $N_0$**



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



**e) Find lower bound of running time of constant function  $f(n) = 2n^2 + 5n^3 + 6n + 4$ . Find 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# [Signature]

Total Marks: 10

Total Time Allowed: 20 Mins

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; i++  
cout<<"rana marwat hussain"<<endl; i++  
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";  
    }  
}
```

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

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

$$+ n$$

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

$$NO = n^2$$

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

$$n + 1 + 1 + 1$$

7

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

$$b(n) \leq c \cdot g(n)$$

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

$$N_0 = 1$$

$$c = 6993$$

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

$$b(n) \leq c \cdot g(n)$$

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

$$N_0 > n^3$$

$$c = 12$$

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

$$b(n) \geq c \cdot g(n)$$

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

$$c = 1$$

$$N_0 = n$$



# UNIVERSITY OF MANAGEMENT & TECHNOLOGY, LAHORE CAMPUS

SST, Department of Computing (CS)

Quiz# 1 – Theory Paper: AOA V4

Instructor: Rana Marwat Hussain

Name # M. Zali

SID # F2020260128 Signature# \_\_\_\_\_

Total Marks: 10

Total Time Allowed: 20 Mins

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";
    }
}
```

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

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

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

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

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

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

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

Handwritten work in the answer box:

- Top left:  $\frac{n(n+1)}{2}$  and "Ans 2"
- Middle left:  $n(n)$
- Bottom left:  $2n^4$
- Right side:  $\sum_{i=0}^n n$
- Center: "Ans 2" with a red circle around it.
- Bottom right:  $4n+6$ ,  $4n+6$ , and  $2/0$  with a red 'X' over it.



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

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

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

$$= n^2$$

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

$$f(n) \leq c \lg n$$

$$f(n) = 6993$$

$$c = ?$$

$$f(n) = 6993 \leq c \lg n$$

$$6993 \leq c(n_0)$$

$$6993 \leq 6993 \lg(n_0)$$

$$6993 \leq 6993 \lg(n_0)$$

$$c = 6993$$

$$c \lg(n_0) \quad n_0$$

d) Find upper bound of running time of constant function  $f(n) = 2n^2 + 5n^3 + 6n + 45$  C &  $N_0$

$$f \leq c \lg n \quad c = 12$$

$$\text{put } n=1$$

$$f(1) = 2n^2 + 5n^3 + 6n + 45$$

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

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

$$13 = 13$$

$$f(n) \leq c \lg n$$

$$= n_0$$

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

$$13 = 13$$

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

$$= 12 n_0$$

$$6(1) = 36(1)$$

$$60 = 60$$

e) Find lower bound of running time of constant function  $f(n) = 2n^2 + 5n^3 + 6n + 45$  C &  $N_0$

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

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

$$13 = 13 n_0$$

$$c \lg(n_0)$$

$$n_0$$



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 # F2019266371

Signature# @mel

Total Marks: 10

Total Time Allowed: 20 Mins

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";  
    }  
}
```

$n(n+n+n)$

$1(4)$

4

$\frac{n^3}{3}$

atataa (4a)

6

b) Compute time Complexity of the code snippet:

Suppose we have N size of Arrays.

get (arr, x, low, high)

repeat till low = high ✓ (121)

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

$O(n)$

$7L(n)$

9

1st arr  
2nd arr  
3rd arr  
4th arr  
5th arr  
6th arr  
7th arr  
8th arr  
9th arr  
10th arr  
11th arr  
12th arr  
13th arr  
14th arr  
15th arr  
16th arr  
17th arr  
18th arr  
19th arr  
20th arr  
21st arr  
22nd arr  
23rd arr  
24th arr  
25th arr  
26th arr  
27th arr  
28th arr  
29th arr  
30th arr  
31st arr  
32nd arr  
33rd arr  
34th arr  
35th arr  
36th arr  
37th arr  
38th arr  
39th arr  
40th arr  
41st arr  
42nd arr  
43rd arr  
44th arr  
45th arr  
46th arr  
47th arr  
48th arr  
49th arr  
50th arr  
51st arr  
52nd arr  
53rd arr  
54th arr  
55th arr  
56th arr  
57th arr  
58th arr  
59th arr  
60th arr  
61st arr  
62nd arr  
63rd arr  
64th arr  
65th arr  
66th arr  
67th arr  
68th arr  
69th arr  
70th arr  
71st arr  
72nd arr  
73rd arr  
74th arr  
75th arr  
76th arr  
77th arr  
78th arr  
79th arr  
80th arr  
81st arr  
82nd arr  
83rd arr  
84th arr  
85th arr  
86th arr  
87th arr  
88th arr  
89th arr  
90th arr  
91st arr  
92nd arr  
93rd arr  
94th arr  
95th arr  
96th arr  
97th arr  
98th arr  
99th arr  
100th arr

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

$C = 699$

9

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

$5n^3 + 2n^2 + 6n + 4 - 5$   
 $5n^3 + 2n^2 + 6n - 1$   
 $5n^3 + 2n^2 + 6n - 1$   
 $5n^3 + n(2n + 6) - 1$

9

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

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

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

✓