

LAB 6 – 21.09.2022

ANALYSIS OF ALGORITHMS

Evaluation

Observation – 5 marks

Spot – 5 marks

Execution – 15 marks

OBSERVATION

1. What is the time complexity of following code:(1)

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}
```

2. What is the time and space complexity of following code:(1)

```
int a = 0;

for (i = 0; i < N; i++) {
    for (j = N; j > i; j--) {
        a = a + i + j;
    }
}
```

3. What is the time and space complexity of following code:(1)

```
int i, j, k = 0;

for (i = n / 2; i <= n; i++) {

    for (j = 2; j <= n; j = j * 2) {
        k = k + n / 2;
    }

}
```

4. What is the time and space complexity of following code:(1)

```
int a = 0, i = N;

while (i > 0) {

    a += i;

    i /= 2;

}
```

5. What is the time and space complexity of fun()? (1)

```
int fun(int n)
{
    int count=0;
    for(int i=n;i>0;i/=2)
        for(int j=0;j<i;j++)
            count+=1;
    return count;
}
```

EXERCISE

6. Given an array of n integers, write an algorithm to find the smallest element. Find number of instruction executed by your algorithm. What are the time and space complexities? (3)

7. Write an algorithm to find the median of n numbers. Find number of instruction executed by your algorithm. What are the time and space complexities? (3)

8. Consider the following pseudo code for the bubble sort algorithm.(4)

```
For i=n-1 to 1
    For j=0 to i-1
        If(a[j]>a[j+1])
            Swap(a[j],a[j+1])
        Endif
    Endfor
Endfor
```

- (i) How many passes through the outer loop will occur
 - a. for an array of 5 elements?
 - b. For an array of 10 elements
- (ii) Write down the time and space complexities.

9. Implement generic bubble sort algorithm for the following integer array (5)

3	7	8	5	2	1	9	5	4
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SPOT

10. Implement the conversion of infix to postfix expression using stack for the following expression (5 marks)

$$K+L-M*N+(O^P)*W/U/V*T+Q$$

Briefly give the answers for the following questions

- (i) What is the output of the following expression: 2 3 4 5 + *- 2.
- (ii) What is the maximum difference between number of operators and operands?
- (iii) What is the advantage of postfix expression?
- (iv) Which expression doesn't require parenthesis?
- (v) What is the output of the following expression: + * - 2 3 4 5