

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-1 EXAMINATIONS-2022

B.Tech-VII Semester -Minor MSCE, 4th Year

COURSE CODE (CREDITS): 18B1WCI743 (2)

MAX. MARKS: 15

COURSE NAME: ADVANCED ALGORITHMS

COURSE INSTRUCTORS: Ms. DIKSHA HOODA

MAX. TIME: 1 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. a) Find θ bound for $f(n) = \frac{n^2}{2} - \frac{n}{2}$

[Marks: 1*3, CO-1]

b) Prove $f(n) = 100n = 5 \neq \Omega(n^2)$.

c) Find upper bound for $f(n) = 410$.

Also, give the values for c and n_0 for all the above.

Q2. What are the different Asymptotic Notations? Explain with example.

[Marks: 3, CO-1]

Q3. a) Write the pseudo code of Insertion Sort, following all the conventions of pseudo code writing. Show the 6th pass of Insertion Sort performed in detail, along with the values of the iterative variables, on the following array:

[Marks: 1*3, CO-3]

4,5,12,48,49,23,12,3

b) What is the worst case analysis and best case analysis of Insertion Sort Algorithm?

c) Is it possible to solve the following recurrence relations using master's method? If yes, then calculate the time $T(n)$ for the same. If No, then state why?

$$T(n) = 3T(n/2) + n$$

Q4. a) Why is it crucial to analyze the complexity of an algorithm?

[Marks: 1*3, CO-1]

b) Write an algorithm for linear search and calculate its time and space complexity.

c) What is the need for performing worst case analysis on an algorithm?

Q5. a) Find the time complexity of the below recurrence:

[Marks: 1*3, CO-1]

$$T(n) = \begin{cases} 3T(n-1), & \text{if } n > 0, \\ 1, & \text{otherwise} \end{cases}$$

b) Write the recurrence relation $T(n)$ of the function given below:

```

public void function( int n ) {
    if( n == 1 ) return;
    for(int i = 1 ; i <= n ; i ++ )
        for(int j = 1 ; j <= n ; j ++ )
            System.out.println( "*" );
    function( n-3 );
}

```

c) Find out running time of the function given below:

```

public void function( int n ) {
    if(n == 1) return;
    for(int i = 1 ; i <= n ; i ++ ) {
        for(int j= 1 ; j <= n ; j ++ ) {
            System.out.println( "*" );
            break;
        }
    }
}

```

*****Best of Luck*****