



NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech.

Mid Semester Examinations, October-2022

Course Name: Data Structures

Date: 14/10/2022

Duration: 1 Hour 30 Minutes

Course Code: CS201

Time: 09:30 AM-11:00 AM

Max. Marks: 50

ANSWER ALL QUESTIONS

1. In C language, if the base address of `int a[5][7][3]` is 100, is it possible to calculate the address of `a[3][5][1]` in column major order? (Assume the size of int to be 2 bytes). *find its location* $(1 \times 3 \times 2 + 3 \times 2 + 1)$ (6 Marks)

2. Using stack, evaluate the following expression.

$7 \ 1 \ 2 \wedge / 3 \ 4 \ * + 6 \ 2 \ * -$

Note: single digit operands are used.

\wedge indicates exponential operator.

Write down all the steps required.

(6 Marks)

3. Consider the following pseudo code of a function named star. Explain the following function for $t = 64$? (Assume there is no syntax error) (6 Marks)

```
void star(int t)
{
    int x;
    Stack Z; // Assume empty stack Z is created.
    while (t > 0)
    {
        // Pushes t%4 to stack Z
        push(&Z, t%4);
        t = t/4;
    }
    // Execute till Stack Z is not empty
    while (!isempty(&Z))
    {
        x = pop(&Z);
        printf("%d ", x*x);
    }
}
```

4. Describe node structure of a circular linked list. Write a 'C' functions to insert a node in the circular linked list. (6 Marks)
5. Write algorithms for Enqueue and Dequeue operations of a Queue data structure. (6 Marks)

$$\begin{array}{r} 63 \\ -16 \\ \hline 47 \\ -9 \\ \hline 38 \\ -2 \\ \hline 36 \\ -15 \\ \hline 21 \end{array}$$

$$6. \quad f(n) = \begin{cases} n^3 & 0 < n < 10000 \\ n^2 & n \geq 10000 \end{cases}$$

$$g(n) = \begin{cases} n & 0 < n < 100 \\ n^3 & n > 100 \end{cases}$$

Write the condition for $f(n) = O(g(n))$.

$\log n < 10000$

(6 Marks)

7. How many cells are required in stack for the following code segment?

(6 Marks)

A(n)

{

if(n >= 1)

{

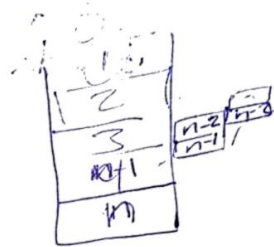
A(n-1);

printf("NITGoa");

A(n-1);

}

}



8. $f_1 = 2^n, f_2 = n^{3/2}, f_3 = n \log n, f_4 = n^{\log n}$, n belongs to set of natural numbers. Write the sequence of comparisons of all the above functions.

(8 Marks)

10

$\log_{10} 3 = x$
 $10^x = 3$