

Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. (Mid-Sem)

Branch	: CSE	Semester	: II
Title of the Course	: Data Structures	Course Code	: CSB 102
Time: 2 Hours		Maximum Marks : 25	

Note: All Sections are compulsory. Attempt all questions in each section before moving onto the next section. Assume any missing data if necessary.

Section A

1. Write an algorithm that determines if a string consists of a number of A's followed by the same number of B's using stacks. (2)
2. Consider the following arithmetic expression P, written in postfix notation.
P: 12, 7, 3, -, /, 2, 1, 5, +, *, +
 - a. Evaluate the infix expression. (1)
 - b. Evaluate the P using stack algorithm. (1)
3. Write an algorithm for postfix expression evaluation. (2)
4. Find constants C_1 , C_2 , n_0 and $g(n)$ for the theta notation using asymptotic analysis.
 $f(n) = 5 \cdot 2^n + 3 \cdot n + 5$ (3)

Section B

1. Consider a 2-D array 'A', where the size of A is 10x5. The size of each element of the array is 2 bytes. If A[-3,-3] begins at address 150 and the elements of array are stored in row-major order. Compute the address of A[3][0] using formula. (2)
2. Give an analysis of the running time for the following code : (2)

```
A ()
{
    int i, j, k;
    for (i = n/2 ; i <= n; i++)
        for (j = 1 ; j <= n; j = 2*j)
            for (k = 1 ; k <= n; k = k*2)
                printf ("Ravi")
}
```
3. Write the algorithms for insertion and deletion operations performed on the circular queue. (2)
4. Write a program in C to implement multiple queue in 1-D array. (2)

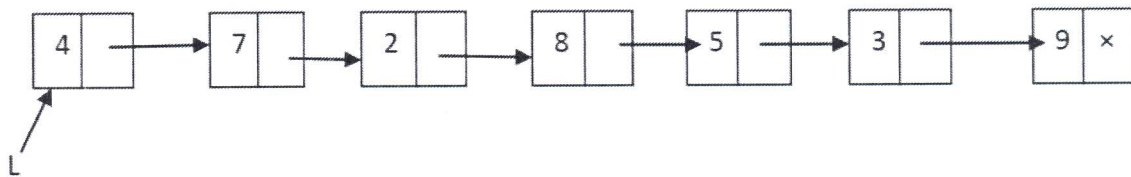
Section C

1. How do you declare doubly linked list in C? Write its advantages and disadvantages. [0.5+0.5]
2. What is the difference between array and linked lists? (Mention Minimum 2 points) [1]
3. Write an algorithm for inserting a node before a given node in a singly linked list. Also, explain each step by using '//' Or '*/' comment symbols. [2]
4. Two polynomials are given as follows:

$$f(x) = 5x^4 + 8x^3 + x + 1; \quad g(x) = 5x^3 + 9x^2 + 4x$$

Write the logical statement for addition above two functions through linked lists. Also write comments on each operation. [2]

5. Consider the following linked list:



Read the below given statements. Describe each step and compute the final output value. [2]

- (a). Struct node *P
- (b). $P = L \rightarrow \text{next} \rightarrow \text{next} \rightarrow \text{next};$
- (c). $P \rightarrow \text{next} \rightarrow \text{next} \rightarrow \text{next} \rightarrow \text{next} = L \rightarrow \text{next} \rightarrow \text{next};$
- (d). $L \rightarrow \text{next} \rightarrow \text{next} = P \rightarrow \text{next} \rightarrow \text{next} \rightarrow \text{next};$
- (e). `printf('P → next → next → next → next → next → data');`