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Mid-Term Examination, September 2024

Semester: 3rd

Course: B. Tech
Subject Code: CSE-211
Duration: 1 hour 30 mins

Branch: CSE
Subject Name: Data Structures
Max Marks: 20

Notes:
i. All questions are compulsory.
ii. Provide necessary justifications and clearly explain all steps.

Q.No.	Question	Marks
Q1.	Write a C program to delete nodes at even positions (2nd, 4th, 6th, etc.) from a singly linked list. Demonstrate the step-by-step deletion of the even-positioned nodes using a linked list. Output the linked list after each deletion.	4
Q2	a. Write the formula to find the address of the element at index [i,j] in a sparse left lower triangular matrix representation stored in row-major order. Consider the base address of a 4×4 lower triangular integer matrix to be 1024. Calculate the address of the element at index [2,1]. b. A square band matrix $D_{n,a}$ is an n x n matrix in which all the nonzero terms lie in a band centred around the main diagonal. The band includes the main diagonal and a-1 diagonals below and above the main diagonal. i. How many elements are there in the band $D_{n,a}$ ii. Assume that the band of $D_{4,3}$ is stored sequentially in an array B. What should be the size of the array and if row-major order is used to store the matrix, what will be the address of element D[3,2]?	2+2
Q3.	a. Illustrate the multiple ways and write declaration code for polynomial representations using an array and linked list stating the limitations and advantages of each.	4
	b. Suppose L is a LIST and p, q, and r are positions. As a function of n, the length of list L, find the time complexity of the program: (see below)	2

```
p := FIRST(L);
while p <> END(L) do begin
    q := p;
    while q <> END(L) do begin
        q:= NEXT(q, L);
        r := FIRST(L);
        while r <> q do
            r:= NEXT(r, L)
    end;
    p := NEXT(p, L)
end;
```

Q4.	a. Demonstrate the following operations in a double-ended queue where the initial deque state is as follows: Front pointer: starts at index 2 and Rear pointer: starts at index 4 [_, a, b, c,_ , _]. I. Enqueue d,e at the rear end. II. Enqueue f at the front end. III. Two dequeues at the rear end. IV. Enqueue g, h at the front end. V. Enqueue i at the rear end. VI. One dequeue at the front end. Show the position of the rear pointer and front pointer after applying every operation.	3
	b. Convert the following infix expression to Reverse Polish Notation (RPN) or postfix notation using a suitable data structure: **(5−2^3^2)+(4÷2)×(1+3)∧(8−4)+(3×2)** After converting the expression to postfix notation, write the final output of the expression.	3

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