Name:.....
Roll No:.....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS),

KOTHAMANGALAM - 686666

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH FIRST SERIES EXAMINATION, AUGUST 2026 (S3 CS,DS,AIML)

B24CS2T01 DATA STRUCTURES

Max. Marks: 40 Duration: 1.5 Hours

PART A

Answer all questions. Each question carries 3 marks.

1. An algorithm to calculate the Factorial of n is implemented using recursion. Contrast its space complexity with an iterative version and explain why they differ. **(CO 1)**
2. Even after a system is successfully tested and deployed, the Maintenance phase is necessary. State three reasons why a system requires ongoing maintenance. **(CO 1)**
3. Differentiate between simple queue with circular queue. **(CO 2)**
4. Given a matrix having l0 rows and l0 columns and 12 nonzero elements. How much space can be saved by representing the matrix in sparse (tuple) form? **(CO 2)**

PART B

Answer all questions. Each question carries 14 marks.

5. (a) How the performance of an algorithm is evaluated? Explain the best, worst and average case analysis of an algorithm with the help of an example. **(CO 1)** (7 marks)

   (b) Define the term "Frequency Count" in algorithm analysis. Compute the frequency count of the statement sum = sum + 1 in the following code:

```
for(i = 1; i <= n; i++)
for(j = 1; j <= i; j++)
sum = sum + 1;
```

   (CO 1) (7 marks)

6. (a) Modern text editors use two stacks—an Undo-Stack and a Redo-Stack—to manage typing history. The system operates under the following Four Rules:
   i. Typing a character- Push the character onto the Undo-Stack.

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ii. Undo operation-Pop the top character from the Undo-Stack and push it onto the Redo-Stack.
iii. Redo operation- Pop the top character from the Redo-Stack and push it back onto the Undo-Stack.
iv. New Action Rule- If a user types a new character after performing an Undo, the Redo-Stack is completely cleared (emptied), as a new timeline of history has started.
Write algorithm/code for the above system operation.

(CO 2) (7 marks)

(b) b) Convert the following infix expression into its postfix equivalent. Show the state of the stack and the result string after each character is scanned:
Expression: `A + B * (C ^D ^E) / (F - G) * H`
.

(CO 2) (7 marks)