(6 pages)

S.No. 6869 **P 22 MACC 1 B**

(For candidates admitted from 2022–2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Mathematics – Core Choice Course

AUTOMATA THEORY

Time : Three hours Maximum : 75 marks

PART A — (20 marks)

Answer ALL questions.

I. (A) Choose the correct answer: (5 × 1 = 5)

1. Let L_1 and L_2 be the sets of strings, then the concatenation of L_1 and L_2 is denoted by ————.

   (a) L_1L2 (b) $L_1 + L_2$

   (c) $L_1 - L_2$ (d) $L_1 * L_2$

2. In $G = \{V, T, P, S\}$ representation of context-free grammar, V stands for ————.

   (a) A finite set of terminals

   (b) A finite set of non-terminals

   (c) A finite set of productions

   (d) Is the start symbol

3. The leftmost symbol of the stack is considered to be at the ———— of the stack.

   (a) top

   (b) bottom

   (c) right

   (d) left

4. A ———— acts as an interface between the source program and the rest of the phases of compiler

   (a) semantic analyzer

   (b) parser

   (c) lexical analyzer

   (d) syntax analyzer

5. Top-down parsing is a technique to find ————.

   (a) Leftmost derivation

   (b) Rightmost derivation

   (c) Leftmost derivation in reverse

   (d) Rightmost derivation in reverse

(B) Fill in the blanks: (5 × 1 = 5)

6. In regular expression * has higher precedence than ————————.

7. Which grammar is also known as Backus-Naur form ————————.

8. The empty stack is denoted by ————————.

9. A tool for automatically generating a lexical analyzer for a language is defined as ————————.

10. Which parsing technique is a kind of bottom-up parsing ————————.

II. Answer the following questions: (5 × 2 = 10)

11. Define Finite Automaton.

12. What are the advantages of context-free grammar?

13. Define deterministic PDA.

14. Define Lexeme.

15. Define recursive predictive parsing.

PART B — (5 × 5 = 25)

Answer ALL questions.

16. (a) Explain deterministic finite automata.

Or

(b) If L is accepted by a *DFA*, then prove that L is denoted by a regular expression.

17. (a) Write a grammar to generate a palindrome.

Or

(b) What are the capabilities of CFG?

18. (a) Define pushdown automaton.

Or

(b) Prove that if L is in $N(M_1)$ for some PDA M_1, then L is $L(M_2)$ for some PDA M_2.

19. (a) What is the role of a lexical analyzer?

Or

(b) What are strings and languages in lexical analysis? What are the operations performed on the languages?

20. (a) Define parsing. What is the role of a parser?

Or

(b) Write down the algorithm for recursive-descent parsing. Explain with an example.

PART C — ($3 \times 10 = 30$)

Answer any THREE questions.

21. Let L be a set accepted by a nondeterministic finite automaton. Then prove that there exists a deterministic finite automaton that accepts L.

22. What is an ambiguous grammar? Specify the demerits of ambiguous grammar. Explain with the help of an example how ambiguity can be removed.

23. If L is a context-free language, then prove that there exists a Push Down Automata M such that $L = N(M)$.

24. What do you understand by the terms tokens, patterns, and lexemes?

25. Explain operator precedence parsing method of shift-reduce parsing.

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