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B.Sc/5th Sem (H)/COMP/23(CBCS)

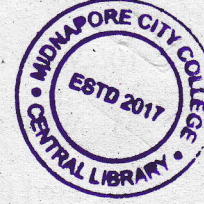
2023

5th Semester Examination  
COMPUTER SCIENCE (Honours)

Paper : C 12-T

[Theory of Computation]

[CBCS]



Full Marks : 60

Time : Three Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*

**Group - A**

Answer any *ten* of the following questions :

2×10=20

1. State the definition of pumping lemma for regular set.
2. What is recursively enumerable language?
3. What is Turing Machine?
4. What is inherent ambiguous grammar?
5. Define DFA.

P.T.O.

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6. What is the principle of mathematical induction?
7. Define Transition Diagram.
8. Differentiate regular expression and regular language.
9. What is parse tree?
10. What is Type-2 grammar?
11. What are the closure properties of CFL?
12. Find the regular expression for Strings of  $(a, b)$  having at least two 'b's.
13. What is undecidable problem?
14. What are the different types of languages accepted by a PDA and define them?
15. Differentiate  $L^*$  and  $L^+$ .

**Group - B**

Answer any *four* questions.

5×4=20

16. Prove any two closure properties of regular language.
17. Convert the following grammar into CNF :  
 $S \rightarrow cBA, S \rightarrow A, A \rightarrow cB, A \rightarrow AbbS, B \rightarrow aaa.$
18. Construct the PDA accepting the language  $\{(ab)^n \mid n \geq 1\}$  by empty stack.

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19. Distinguish NFA and DFA with examples.
20. What is non-deterministic PDA? Explain with an example.
21. What is  $\epsilon$ -closure ( $q$ )? Explain with an example.

**Group - C**

Answer any *two* questions.

10×2=20

22. Prove that the halting problem is undecidable.
23. State and prove the pumping lemma for CFL.
24. During a Turing Machine which reverses the given string  $\{abb\}$ .
25. Using pumping lemma for the regular sets, prove that the language  $L = \{a^m b^n \mid m \neq n\}$  is not regular.