

9

(i) Printed Pages : 3

Roll No.

(ii) Questions : 9

Sub. Code :

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Exam. Code :

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M.Sc. Information Technology 3rd Semester
(2125)

THEORY OF COMPUTATION

Paper : MS-69

Time Allowed : Three Hours]

[Maximum Marks : 80

Note :— Attempt five questions in all. Question No. 9 (Section E) is compulsory and select one question each from Sections A to D.

SECTION—A

1. (i) Explain in detail the concepts of Automata, Transition Systems, Languages, and Grammars. Illustrate your answer with suitable examples.
- (ii) Design a DFA over the alphabet $\{0,1\}$ that accepts all strings where the number of 0's and the number of 1's are both odd. 8+8=16
2. (i) Explain the equivalence of DFA and NFA with an example. Also highlight the significance of minimization of finite automata.
- (ii) Describe the four language classes (Type-0 to Type-3), their corresponding grammars, and automata. 8+8=16

SECTION—B

3. (i) Write short note on Arden's theorem.
(ii) For two regular languages L_1 and L_2 , prove that $L_1 \cdot L_2$ (concatenation) is regular. 8+8=16
4. (i) Use the Pumping Lemma to prove that the language $L = \{0^n 1^n \mid n \geq 0\}$ is not regular.
(ii) Discuss equivalence of two finite automata using suitable example. 8+8=16

SECTION—C

5. (i) Convert context-free grammar
 $G : S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$ to Chomsky Normal form.
(ii) Write short note on push down automata with an example. 8+8=16
6. (i) Convert the following CFG to Greibach Normal form,
 $G = (V, \Sigma, R, S), V = \{S, A, B\}$ (non-terminals),
 $\Sigma = \{a, b\}$ (terminals)
production rules are: $S \rightarrow AB \mid b, A \rightarrow aA \mid a, B \rightarrow bB \mid b$
(ii) Write short note on parser design and its characteristics. 8+8=16

SECTION—D

7. (i) Construct a Turing machine to add two numbers.
(ii) Write short notes on Halting problem with an example. 8+8=16

8. (i) Construct a Turing machine to subtract two numbers.
(ii) Write short notes on post machine working. $8+8=16$

SECTION—E

(Compulsory Question)

9. (i) Define Mealy and Moore machines.
(ii) Discuss Pumping lemma for regular sets.
(iii) Discuss CYK algorithm and its complexity.
(iv) Discuss Universal Turing machine. $4 \times 4 = 16$