

(i) Printed Pages: 3

Roll No.

(ii) Questions : 9

Sub. Code :

3	6	1	9
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Exam. Code :

0	4	6	1
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M.Sc. Information Technology 3rd Semester
(2122)

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 selecting one question each from Sections A to D.

SECTION—A

1. (i) What is a non-deterministic finite automaton ? Design a non-deterministic FA that reads strings made up of $\{0, 1\}$ and accepts only those strings which end in either '00' or '11'.
- (ii) Convert the automata of Mealy machine to Moore machine. $Q = \{q_0, q_1\}$, $\Sigma = \{0, 1\}$ and $\{A, B\}$ are output alphabets :
- $$\begin{aligned} \delta(q_0, 0, A) &= q_0, & \delta(q_0, 1, B) &= q_1, & \delta(q_1, 0, B) &= q_1, \\ \delta(q_1, 1, A) &= q_0 & & & & 8+8=16 \end{aligned}$$
2. (i) Construct a non-deterministic FA accepting $\{ab, ba\}$ and use it to find deterministic automaton accepts the same set.
- (ii) Discuss Chomsky classification of languages with examples. 8+8=16

SECTION—B

3. (i) Discuss Arden theorem with an example.
(ii) Discuss conversion of NFA to DFA with examples.

8+8=16

4. (i) Construct regular expression for the given DFA :

$$\delta(q_1, 0) = q_1, \delta(q_1, 1) = q_2, \delta(q_2, 0) = q_3, \delta(q_2, 1) = q_2, \\ \delta(q_3, 0) = q_3, \delta(q_3, 1) = q_3 \text{ for}$$

$$(\{q_1, q_2, q_3\}, \{0, 1\}, \delta, q_1, \{q_2\}).$$

- (ii) Convert the given regular expression into DFA for
 $(0 + 1)^*(00 + 11)(0 + 1)^*$

8+8=16

SECTION—C

5. (i) Discuss CYK algorithm in detail with the help of an example.
(ii) Construct a PDA for language $\{L = a^n b^n C^n | n \geq 1\}$.

8+8=16

6. (i) Convert the grammar with following productions to CNF :

$$S \rightarrow ABa, A \rightarrow aab, B \rightarrow Ac$$

- (ii) How GNF different from CNF ? Also, discuss significance of terminal symbol in CNF and GNF.

8+8=16

SECTION—D

7. (i) Design a Turing machine to multiply two numbers.
(ii) List LR(K) grammar properties with examples.

8+8=16

8. (i) Discuss halting problem and post correspondence problem.

(ii) Design a Turing machine to find even length palindrome.

8+8=16

SECTION—E

(Compulsory Question)

9. (i) Discuss difference between $(Q, \Sigma, \delta, q_0, F)$ and $(Q, \Sigma, \delta, q_0, Q - F)$. Give an example.

(ii) Prove : If L_1 and L_2 are two regular languages, then $L_1 \cup L_2$ is regular or not ?

(iii) What is significance of evaluating last state in CYK ?
What is complexity of CYK ?

(iv) List Chomsky hierarchy. What is Turing machine model stand in Chomsky hierarchy ?

4×4=16