

Roll No.

3229

**B. Tech. 5th Semester (CSE)
Examination – March, 2021**

FORMAL LANGUAGES AND AUTOMATA

Paper : PCC-CSE-305-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

*Note : Attempt **five** questions in all, selecting at least **one** question from each Section. Question No. 1 is **compulsory**.*

1. Explain the following Questions : 6 × 2.5 = 15

- (a) Any *two* differences between DFA and NFA.
- (b) Define PDA.
- (c) Give an example of an undecidable problem.
- (d) What are Limitations of FSM ?
- (e) Define Computability.
- (f) Define unrestricted Grammar.

SECTION - A

2. (a) For the following non-deterministic finite automata, make equivalent deterministic finite automata. 10

	a	b
$\rightarrow Q_0$	Q_0, Q_1	Q_2
Q_1	Q_0	Q_1
Q_2	-	Q_0, Q_1

- (b) Prove that regular sets are closed under concatenation. 5
3. What are Mealy/Moore machines? Explain, can these machines work like one another? If yes, then explain with an example to convert Moore to Mealy machine. 15

SECTION - B

4. (a) Prove that a Language is regular if and only if it is accepted by finite automata. 7.5
- (b) Define leftmost and rightmost derivation. Explain by taking suitable examples. 7.5
5. State and prove Arden's Method. 15

SECTION - C

6. (a) Define Chomsky normal form. Simplify the following CFG and convert it into CNF 7.5
- $S \rightarrow ASB/\epsilon$
 $A \rightarrow aAS/a$
 $B \rightarrow SbS/A/bb$

- (b) Show that the language 7.5

$L = \{WW^R \mid W \in \Sigma(a,b)^*\}$ is not regular.

7. Construct a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store. Construct the corresponding CFG accepting same set. 15

SECTION - D

8. Discuss the halting problem and PCP problem of turing machines. 15
9. (a) What are primitive recursive functions? Show that the following is primitive recursive: 8

$$R(x, y) = x - y$$

- (b) What do you mean by computability? Explain in detail. 7