

Roll No.

3229

B. Tech. 5th Semester (CSE)

Examination – December, 2022

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 *one* question from each Section. Question No. 1 is *compulsory*.

1. Explain the following Questions :

- (a) Define finite automata with output briefly.
- (b) What is context sensitive language ?
- (c) When do you say that Turing machine accept a string ?
- (d) State Halting Problem of Turing machine.
- (e) Define PCP problem.
- (f) Closure properties of Regular Sets. $6 \times 2.5 = 15$

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P. T. O.

SECTION - A

2. (a) $M = (\{q_1, q_2, q_3\}, \{0, 1\}, \delta, q_1, \{q_3\})$ is a NFA, where δ is given by :
- $\delta(q_1, 0) = \{q_2, q_3\}$ $\delta(q_1, 1) = \{q_1\}$
 $\delta(q_2, 0) = \{q_1, q_2\}$ $\delta(q_2, 1) = \emptyset$
 $\delta(q_3, 0) = \{q_2, \}$ $\delta(q_3, 1) = \{q_1, q_2\}$
- construct an equivalent DFA. 10
- (b) What do mean by regular expression ? Explain in detail. 5
3. (a) Construct a Finite Automata equivalent to the regular expression :

$$ba + (a + bb)a^*b$$

- (b) Take an example of Melay and Moore machine each and process any string of at 4 alphabets from these machines and produce the resulting strings. 5

SECTION - B

4. (a) What do mean by Pumping Lemma and applications of pumping lemma ? 7.5
- (b) What do you mean by ambiguity ? How do prove that the grammar is ambiguous or not ? Explain by taking suitable example. 7.5
5. Construct a DFA accepting all strings over {a,b} ending in ab. 15

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SECTION - C

6. (a) What do mean by reduced form of a CFG ? Explain with example. 7.5
- (b) What are normal forms of CFG ? Explain convert a CFG into CNF.
- $S \rightarrow AACD, A \rightarrow aAb \mid a, D \rightarrow aDa \mid bDb \mid a, C \rightarrow aC \mid C$ 7.5
7. (a) Design a PDA for the language 8
- $L = \{w \in \{a,b\}^* \mid w \text{ has equal number of a's and b's}\}$
- (b) Differentiate between PDA and NPDA with the help of example. 7

SECTION - D

8. (a) Define Turing machine. Design a Turing machine that computes the integer function f defined as follows : 8
- $f(n) = 3^n$ where n is integer and $n \geq 0$.
- (b) Explain TMs as Enumerators. 7
9. Explain the following with example : 2 × 7.5 = 15
- (a) Partial recursive functions
- (b) Primitive recursive functions

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