53 (IT 503) THCP

2021

THEORY OF COMPUTATION

Paper : IT 503

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Design a Moore machine to detect a run in the input, that is, sequence of two or more identical symbols. For example, given the input abaabbbabaa, the output shall be 00010110001. 10

   (b) Construct PDA for the language $a^n b^m$, where $m = n \times 3$. 10

2. *(a)* Simplify the following regular expression :

   $(00 + 11 + 01 + 10)^*$ 5

Contd.

(b) Construct the regular expression : string over $\{a, b\}$ with atmost three a's. 5

(c) The following grammar is not regular. Convert it to an equivalent regular grammar. What is the language of the grammar ? 5

$S \rightarrow 0S|1A,\ A \rightarrow A1|\varepsilon$

(d) How to remove ambiguity from a grammar ? 5

3. Construct the finite automata for the following language : 10+10=20

(a) The set of all binary strings that do not contain three or more consecutive zeros.

(b) The set of all strings that are palindrome of length 4. The alphabet is $\{a, b, c\}$.

4. If the alphabet is $\{a\}$, what is the complement of a*? of a+? Explain with examples, closure properties of regular language. 20

5. *(a)* Show that

$L = \{w \mid \text{length of } w = 3 \times \text{numbers of } a\text{'s in } w\}$

is a context-free language. The alphabet is $\{a, b, c\}$. 10

(b) Construct a Turing machine to accept all positive binary numbers divisible by 4. 10

6. Write short notes on : 10×2=20

(a) Pumping Lemma

(b) Minimization of finite automata.