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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

$S \rightarrow OS \mid 1A, A \rightarrow A1 \mid \varepsilon$

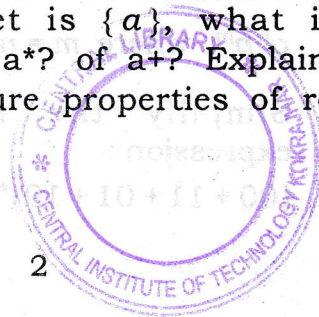
(d) How to remove ambiguity from a
grammar? 5

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



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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.

