53 (IT 503) THCP

2018

THEORY OF COMPUTATIONS

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)* Consider the grammar :
$S \to 0S0 \mid 1S1 \mid SS \mid \wedge$.

Given string 0101101110, find a leftmost derivation and a rightmost derivation with corresponding parse trees. 5

(b) Is the following grammar ambiguous ?
$S \to AB \mid aaB,\ A \to a \mid Aa,\ B \to b$. 10

(c) Construct an unambiguous equivalent of the grammar $S \to SaS \mid b$. 5

Contd.

2. *(a)* Convert the following grammar to Greibach Normal Form : 10

$S \rightarrow abSb \mid aa$

(b) Write the statement of Pumping Lemma and prove it. 10

3. Define Turing Machine and Pushdown Automata. Explain the acceptability of an input by Pushdown Automata. Explain with an example, processing of a string by a Turing Machine. 6+4+10=20

4. Draw Finite Automata for the following : 5×4=20

(a) Binary strings which when interpreted as positive integers are divisible by 4.

(b) Binary strings that do not contain the substring 101.

(c) Strings over the alphabet $\{a,b\}$ of the form $(ab)^n$, for example *ababab*.

(d) Binary strings starting with 000 or ending with 111.

5. Construct the regular expression for the following and then find the equivalent regular grammar : 10+10=20

(a) Binary strings containing at least one 00 and at least one 11.

(b) Binary strings beginning with 1 and ending with 0.

6. *(a)* Describe with an example, conversion of Mealy machine to Moore machine. 10

(b) Describe with an example, minimization of a DFA. 10

7. Write short notes on : 10×2=20

(a) Chomsky Hierarchy

(b) Undecidability.
