53 (CS 502) ThCP

2019

THEORY OF COMPUTATION

Paper : CS 502

Full Marks : 100

Time : Three hours

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

Answer **any five** questions.

1.   10×2=20

   (a) Define alphabets and string of a
   language.

   (b) What do you mean by Finite in a
   Deterministic Finite Automata ?

   (c) What do you mean by Nondeterministic
   in a Nondeterministic Finite Automata ?

   (d) Define left linear grammar.

   (e) Define transition function of an NFA.

(f) Stack operation is involved in _____ . (DFA, NFA, PDA, TM)

(g) What is the utility of Pumping lemma?

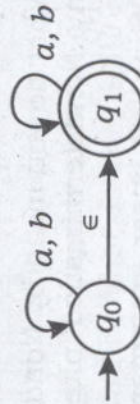(h) Language accepted by a PDA is _____ (type-0, type-1, type-2, type-3) language.

(i) Write the regular expression of the language $L = \{w \in \{0,1\}^* :$ start symbol of w is not 0 and the end symbol of w is not 1\}.

(j) What is derivation tree?

2. (a) Define regular and non-regular language with examples.

(b) Write a DFA or NFA for the language $L = \{w_1 w_2 : w_1 \in \{a,b\}^*$ and $w_2 \in \{a,b\}^*\}$.

(c) Remove $\in$ from the following diagram :

6+7+7=20

3. (a) Define regular expression.

(b) Write a regular expression of the language $L = \{w_1 abw_2 : w_1 \in \{a,b\}^*$ and $w_2 \in \{a,b\}^*\}$.

(c) Find the regular expression of the following diagram :

5+7+8=20

4. (a) Define grammar. What is context-free grammar?

(b) Write the grammar of the language $L = \{ww^R : w \in \{a,b\}^*\}$

(c) What is ambiguous grammar? Explain with an example. What is the problem of ambiguity?

5+7+8=20

5. (a) Define Chomsky Normal Form. Convert the following grammar to Chomsky Normal Form.

$S \to ASB$
$A \to aAS \,|\, a \,|\in$
$B \to SbS \,|\, A \,|\, bb$

(b) Define Push Down Automata. Design a Push Down Automata for the language $L = \left\{ww^R : w \in \{a, b\}^*\right\}$.

10+10=20

6. Define Turing Machine. Design a Turing machine for the language :

$$L = \left\{a^n b^n c^n : n > 0\right\}$$

20

7. Write short notes on :   4×5=20

   (a) Multitape Turing Machine

   (b) Turing thesis

   (c) Primitive Recursive Function

   (d) NPDA.