

FORMAL LANGUAGES & AUTOMATA THEORY

(Information Technology)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Define deterministic finite automata.
 - Define non-deterministic finite automata.
 - Find DFA for $L = \{w:|w| \bmod 3 = 0\}$ where $\Sigma = \{a,b\}$.
 - Find NFA with three states that accepts the language $\{ab,abc\}^*$.
 - Write RE for $L = \{w \in \{0,1\}^* : w \text{ has no pair of consecutive zeros}\}$.
 - What is left factoring?
 - Define primitive recursive function.
 - Distinguish between DPDA and NPDA.
 - Write variations of Turing machine.
 - Explain about modified PCP.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 Describe Chomsky hierarchy of languages with proper examples.

OR

- 3 State and explain Myhill-Nerode theorem.

UNIT – II

- 4 (a) What are the closure properties of regular languages?
(b) Prove that, the following Language is non-regular using pumping Lemma:
(i) $L = \{a^n b^{n+1} \mid n > 0\}$.
(ii) $L = \{ww \mid w \in \{0,1\}^*\}$.

OR

- 5 Explain left & right derivations and also left & right derivation trees with examples.

UNIT – III

- 6 (a) Show that $L = \{a^i b^j \mid j = i^2\}$ is not context free language.
(b) Find if the given grammar is finite or infinite:
 $S \rightarrow AB, A \rightarrow BC|a, B \rightarrow CC|b, C \rightarrow a$

OR

- 7 (a) Explain Ambiguity in CFGs.
(b) Convert the grammar into GNF:
 $S \rightarrow ABb|a, A \rightarrow aaA|B, B \rightarrow bAb$

UNIT – IV

- 8 (a) Find the PDA that accepts the following language:
 $L = \{x \in \{a,b\}^* : |x|_a = 2|x|_b\}$ via empty stack.
(b) Explain instantaneous description.

OR

- 9 Give the equivalence between CFL and PDA.

UNIT – V

- 10 (a) What are undecidable problems? Explain why PCP problem is considered undecidable.
(b) What is a Universal Turing machine?

OR

- 11 Design Turing machine to accept all set of palindromes over $\{0,1\}^*$.also write the instantaneous description on the string 1001001.
