

B.E. / B.Tech. Computer Science & Engineering (Model Curriculum) Semester-V
TEE103CS - Formal Language and Automata Theory

P. Pages : 2

Time : Three Hours



GUG/W/24/13813

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Assume suitable data wherever necessary.
 3. All questions are compulsory.

1. A) Discuss Chomsky Hierarchy in details? 8

B) Convert the following NFA into its equivalent DFA, Where NFA described by the following state transition table initial state = p and final state = {q, s} 8

States	0	1
p	q, s	q
q	r	q, r
r	s	p
s	-	p

OR

2. A) Construct a minimum state automation equivalent to a given automaton M Using pair table method whose transition table is given by, 8

States / Σ	a	b
$\rightarrow q_0$	q_0	q_3
q_1	q_2	q_5
$\odot q_2$	q_3	q_4
q_3	q_0	q_5
q_4	q_0	q_6
q_5	q_1	q_4
q_6	q_1	q_3

B) Design a DFA for the following language $L = \{0^m 1^n 0^k \mid m, n \text{ and } k \geq 0\}$ 8

3. A) Design a DFA for following. 6

1) For a string over $\{0, 1\}$ which either ends with '00' or '11'. 6

2) For a string over $\{0, 1\}$ which does not contain '101' as a substring. 6

B) Reduce the following grammar. 4

$S \rightarrow aA / aBB$

$A \rightarrow aaA / \epsilon$

$B \rightarrow bB / bb / \epsilon$

$C \rightarrow B$

OR

4. A) Convert the following grammar to GNF form. 6
 $S \rightarrow ABA \mid AB \mid BA \mid AA \mid A \mid B$
 $A \rightarrow aA \mid a$
 $B \rightarrow bB \mid b$
- B) Convert the following left linear grammar to equivalent right linear grammar. 6
 $S \rightarrow Aa \mid a \mid b$
 $A \rightarrow Bb \mid Ca \mid a$
 $C \rightarrow c$
- C) Explain the model of PDA. 4
5. A) Construct PDA for the language $L = \{a^{3n}b^n \mid n \geq 1\}$ Write a CFG for the above Language. 8
- B) Design a Linear Bounded Automata which accept palindrome string over $\Sigma = (a, b)$. 8
- OR**
6. A) Explain in brief the working of Linear Bounded Automata and Discuss the closure properties of Context Sensitive grammar. 8
- B) Convert CFG to PDA. 8
 $S \rightarrow 0BB$
 $B \rightarrow 0S \mid 1S \mid 0$
 Test for string 010^4
7. A) Design a TM to perform multiplication of two unary numbers. 8
- B) Describe the variation of Turing Machine. 8
- OR**
8. A) Design a TM for the following language $L = \{a^n b^n c^n d^n \mid n \geq 1\}$ 8
- B) Explain the properties of recursive enumerable sets. 8
9. A) Consider PCP system that described by the following test. 8
 $A = \{1, 10111, 10\}$ and $B = \{111, 10, 0\}$ Does this PCP have solution?
- B) Define Ackermann's function: Compute $A(1, 1)$ and $A(2, 2)$ 8
- OR**
10. Write short note on: 8
- i) Decidable and undecidable problems. 8
- ii) Universal Turing Machine. 8
