(Pages : 3) **G – 3627**

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, June 2019

(2013 Scheme)

13.406 : FORMAL LANGUAGES AND AUTOMATA THEORY (R)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. Each question carries **4** marks.

1. Design a DFA to accept strings over {*a*, *b*] containing even number of *a*'s and odd number of *b*'s.

2. State My-Hill Nerode theorem.

3. What is ambiguous grammar? Give an example.

4. Write the regular expression for set of all strings of zeroes and ones not containing 10.

5. Define recursive and recursively enumerable languages.

(5 × 4 = 20 Marks)

P.T.O.

PART – B

Answer **any one full** question from **each** Module. Each full question carries **20** marks.

Module – I

6. (a) State and prove the equivalence of NFA and DFA. **10**

(b) Design a DFA to accept string of 0's and 1's when interpreted as binary numbers would be multiple of 4. **10**

OR

7. (a) Design Moore Machine for the input from $(0 + 1 + 2)^*$ which print the residue modulo 5 of the input treated as ternary number. **10**

(b) Compare Moore and Mealy Machine. **5**

(c) Describe two way Finite automata. **5**

Module – II

8. (a) State and prove the equivalence of regular expression and finite automata. **10**

(b) Find a regular expression corresponding to finite automata given below. **10**

	States	0	1
→	q_1	q_1	q_2
	q_2	q_3	q_2
	q_3	q_1	q_4
*	q_4	q_1	q_2

OR

9. (a) Draw an ε – NFA for the regular expression $(a+b)^*abb$ and convert it to DFA. **15**

(b) Prove that $L = \{a^p / p \text{ is prime}\}$ is regular or not. **5**

Module – III

10. (a) Define Greibach Normal form (GNF). Convert the following grammar to GNF. **10**

$S \rightarrow AB$ $a \rightarrow$ BS/b $B \rightarrow SA/a$

(b) Check the ambiguity in $S \rightarrow aB/bA$ $A \rightarrow a/a\,S/bAA$ $B \rightarrow b/b\,S/aBB$. **10**

OR

11. (a) Design a PDA to recognize all palindromes over $\{0, 1\}$. **10**

(b) Remove useless symbols of the CFG given below and convert to Chomsky Normal form.

$s \rightarrow 0A0/1B1/BB$ $A \rightarrow C$ $B \rightarrow S/A$ $C \rightarrow S/\varepsilon$ **10**

Module – IV

12. (a) Explain Universal Turing machine. **10**

(b) Design a Turing machine that computes a function $f(m, n) = m \div n$, i.e. proper subtraction of 2 integers defined as $m \div n$ if $m > n$ and 0 otherwise. **10**

OR

13. Design a Turing machine to multiply two numbers. **20**