No. of Printed Pages : 4 **BICS-010**

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

00744

June, 2017

BICS-010 : FORMAL LANGUAGES AND AUTOMATA

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a) Design a DFA for the set of all strings over 0's and 1's such that it contains even number of 0's and even number of 1's. *5*

(b) Design a DFA corresponding to the regular expression

$(a + b)^* aba (a + b)^*$. *5*

2. (a) Prove that $L = \{a^i b^i \mid i \geq 0\}$ is not regular. *5*

(b) Prove that $L = \{a^n : n \text{ is prime}\}$ is not a context-free language (CFL). *5*

3. Write the definition of Mealy Machine and convert the following Moore Machine into equivalent Mealy Machine : *10*

Present State	Next State		Output
	a = 0	a = 1	
→ a	d	b	1
b	a	d	0
c	c	c	0
d	b	a	1

4. Define Turing Machine. Design a Turing Machine that accepts the language

$$L = \{0^n 1^n 2^n \mid n > 0\}.$$ *10*

5. Give the production rule for Type-0, Type-1, Type-2 and Type-3 grammars of the Chomsky hierarchy. Also name the corresponding machine accepted by the different types of languages. *10*

6. (a) Construct a DFA equivalent to the NFA $(\{p, q, r, s\}, \{0, 1\}, \delta, p, \{s\})$, where δ is given by *5*

	0	1
p	p, q	p
q	r	r
r	s	–
s	s	s

(b) Let G be the grammar. Find the left-most derivation, right-most derivation and parse tree for the expression a * b + a * b. *5*

G : $S \rightarrow S + S \mid S * S$

$S \rightarrow a \mid b$

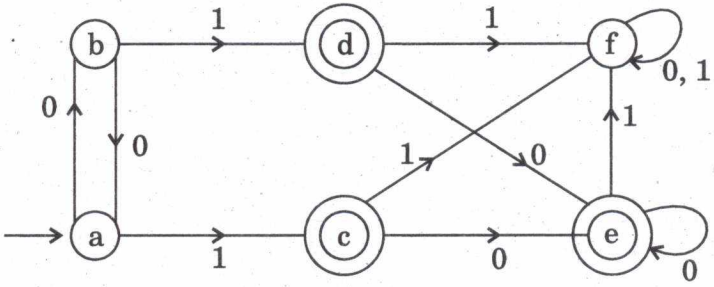
7. Explain the algorithm for the conversion of a Context Free Grammar (CFG) to Chomsky Normal Form (CNF) and use it to convert the following CFG to CNF : *10*

$S \rightarrow bA \mid aB$

$A \rightarrow bAA \mid aS \mid a$

$B \rightarrow aBB \mid bS \mid b$

8. Construct a minimum state automata equivalent to the following diagram : *10*



9. Define PDA. Design a PDA for recognizing the language

$L = \{a^n b^{2n+1} \mid n \geq 1\}$. *10*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Undecidability and Reducibility

(b) Church-Turing Thesis

(c) The set P, NP and NP Complete