

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

Term-End Examination

00426

June, 2015

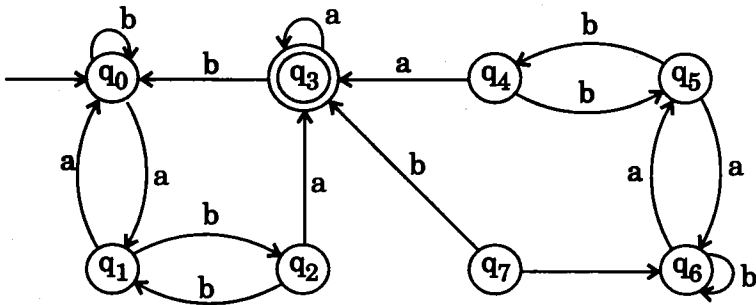
**BICS-010 : FORMAL LANGUAGES AND
AUTOMATA**

Time : 3 hours

Maximum Marks : 70

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

1. (a) Construct the minimum state automata equivalent to the transition diagram. 5



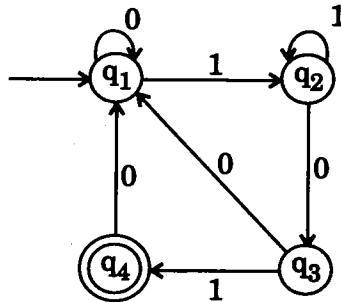
- (b) Show that the set $L = \{ a^{i^2} \mid i \geq 1 \}$ is not regular. 5

2. (a) Define the pumping-lemma for regular set and describe its application. 5

- (b) Design the DFA over $\{0, 1\}$ for even number of 0's and 1's. 5

3. (a) Prove $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*$
 $(0 + 10^*1) = 0^*1(0 + 10^*1)^*$. 5
- (b) Reduce the following grammar G in to
 CNF. 5
 $G = (\{S, A, B, D\}, \{a, b, d\}, \{S \rightarrow aAD,$
 $A \rightarrow aB \mid bAB, B \rightarrow b, D \rightarrow d\}, S)$
4. (a) Convert the grammar
 $S \rightarrow AA \mid a, A \rightarrow SS \mid b$ into Greibach
 Normal Form (GNF). 5
- (b) Show that $L = \{ a^P \mid P \text{ is a prime} \}$ is not a
 context free language. 5
5. (a) Design a pushdown automata for the
 language $L = \{ a^n b^n \mid n \geq 1 \}$. 5
- (b) If a context free grammar is defined by the
 production $S \rightarrow a \mid Sa \mid bSS \mid SSb \mid SbS$, show
 that every string in $L(G)$ has more a's than
 b's. 5
6. (a) Convert the grammar $S \rightarrow aSb \mid A,$
 $A \rightarrow bSA \mid S \mid \Lambda$ to a PDA that accepts the
 same language by empty stack. 5
- (b) (i) Prove $(a + b)^* = a^*(ba^*)^*$.
 (ii) Construct a DFA with reduced state
 equivalent to the regular expression
 $10 + (0 + 11)0^*1$. 5

7. (a) Find the regular expression of the figure. 5



(b) Construct a grammar G generating the language $L = \{ a^n b^n c^n \mid n \geq 1 \}$. 5

8. (a) Define Turing Machine Model and give diagrammatic representation of Turing Machine. 5

(b) Design a Turing Machine that accepts $L = \{ a^n b^n c^n \mid n \geq 1 \}$. 5

9. (a) Define variants of TM. 5

(b) Define Decidability and Decidable language. 5

10. Attempt any *two* from the following : 2×5=10

(a) Define Halting problem of TM.

(b) State Church thesis.

(c) What is CYK algorithm ? Design or construct a TM to accept the set L of all strings over $\{0, 1\}$, ending with 010.