

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

Term-End Examination

December, 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 a minimum state automaton equivalent to the following DFA :

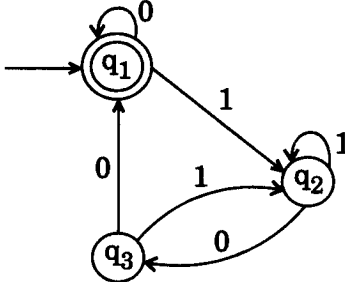
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State	a	b
→ q ₀	q ₁	q ₂
q ₁	q ₄	q ₃
q ₂	q ₄	q ₃
⊙ q ₃	q ₅	q ₆
⊙ q ₄	q ₇	q ₆
q ₅	q ₃	q ₆
q ₆	q ₆	q ₆
q ₇	q ₄	q ₆

- (b) Design a DFA accepting all strings over {a, b}, ending in ab.

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2. (a) Construct a DFA accepting all strings over {a, b} where number of a's is divisible by 3 and b's is divisible by 2. 5
- (b) Construct a Mealy Machine which can output even, odd according to the total number of even or odd 1's encountered. The input symbols are 0 and 1. 5
3. (a) Define grammar and describe the Chomsky hierarchy of grammar. 5
- (b) If $G = (\{S\}, \{0, 1\}, \{S \rightarrow 0S1, S \rightarrow \Lambda\}, S)$, find $L(G)$. 5
4. (a) Construct a regular expression corresponding to the state diagram described by 5



- (b) Show that $L = \{0^i 1^i \mid i \geq 1\}$ is not regular. 5
5. (a) Find the regular expression representing the set of all strings of the form $a^m b^{2n} c^{3p}$, where $m, n, p \geq 1$. 5
- (b) Find a regular expression corresponding to each of the following subset of (a, b) : 5
- (i) The set of all strings containing exactly two a's.
- (ii) The set of all strings containing the substring "aa".

6. (a) Convert the grammar $S \rightarrow AB, A \rightarrow BS | b$
 $B \rightarrow SA | a$ into GNF. 5
- (b) Define Decision algorithm for context free language. 5
7. (a) Convert the grammar $S \rightarrow aSb | A,$
 $A \rightarrow bSa | S | \Lambda$ to a PDA that accepts the same language by empty stack. 5
- (b) Construct a PDA accepting by empty store for the language $L = \{a^n b^{2n} | n \geq 1\}$. 5
8. (a) Define the CYK algorithm. 5
- (b) Define the Turing Machine Model. 5
9. (a) Design a Turing Machine for the language
 $L = \{w C w^T | w \in (a, b)^*\}$. 5
- (b) Define recursive enumerable language. 5
10. Attempt any *two* from the following : $2 \times 5 = 10$
- (a) Define undecidable languages.
- (b) What is the description of a finite automata ?
- (c) Define the procedure for transforming a Mealy Machine into a Moore Machine.
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