6E3203

B.Tech. (VI Sem.) (Main and back) Examination, May 2013

Computer Engineering

6CS3 THEORY OF COMPUTATION

Common to CS and IT

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**. Selecting **one question** from **each unit**. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used calculated must be stated clearly.

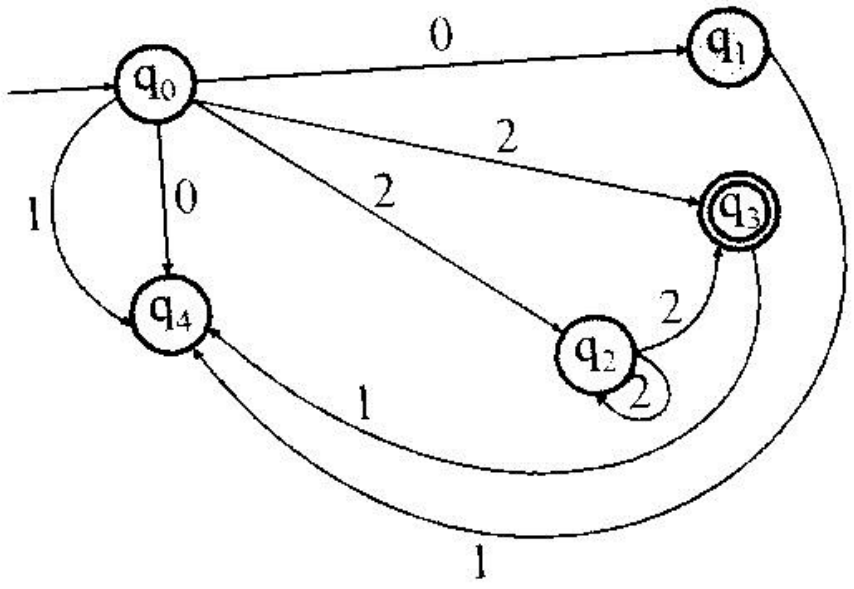
Use of following supporting material is permitted during examination.

1. _____ 2. _____

Unit-I

Q.1 (a) Explain the procedure for minimization of finite automata with example. [8]

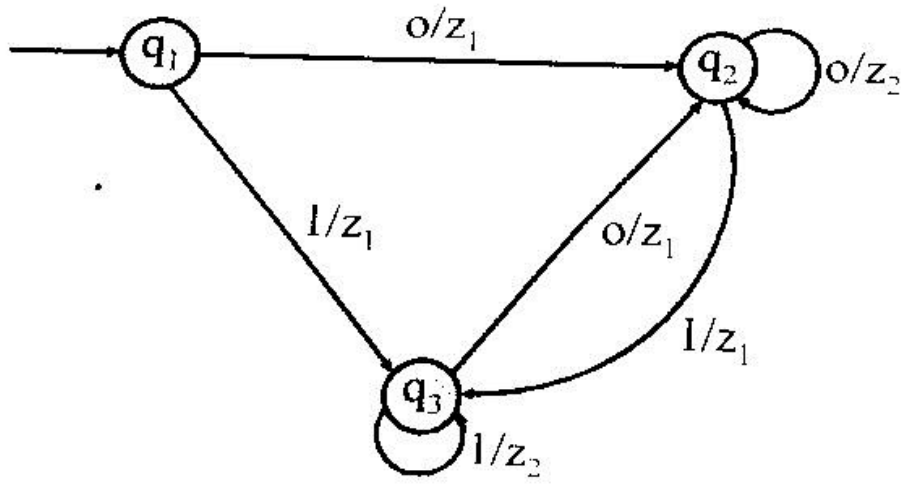
(b) Construct a deterministic finite automata equivalent to following NDFA. [8]



Figure

OR

Q.1 (a) Consider a Mealy Machine given by transition diagram. Construct a Moore Machine equivalent to this Mealy Machine. **[8]**



Figure

(b) Construct a transition system which accepts set of string over $\in = \{0, 1\}$ and is with even no. of zeros and even no. of ones. Also find the acceptability of string 110101. **[8]**

Unit-II

Q.2 (a) Explain Chomsky classification of language with the help of suitable example. **[8]**

(b) Find the regular grammar corresponding to regular expression (011+1)*(01)* **[8]**

OR

Q.2 (a) Write closure property of regular set. **[4]**

(b) Show that $L = \{a^n \ b^n : n_7, 1\}$ is not regular using Mayhill-Nerode theorem. **[6]**

(c) Explain the application of pumping lemma with an example. **[6]**

Unit-III

Q.3 (a) Define Chomsky Normal Form (CNF) for context free grammar. Reduce the following grammar to Chomsky Normal Form.

$$G = (\{s\}, \{a, b, c\}, \{s \rightarrow a/b/css\}, s)$$ **[8]**

(b) The production of any grammar $\in$ is given by

$S \rightarrow 0B/1A \qquad A \rightarrow 0/0S/1AA$

$B \rightarrow 1/1S/0BB$

For the string 00110101, find the leftmost derivation, right most derivation and derivation tree. **[8]**

OR

Q.3 (a) How can a pushdown auto mata be constructed for a given language? Explain with example. **[8]**

(b) Explain the steps involving in conversion from context free grammar to pushdown auto mata with example. |8|

Uniit-IV

Q.4 (a) Write short note on following:

(i) Linear bounded automata (ii) Universal Turing Machine

(b) Design a Turing Machine M to recognize the language $\{1^n, 2^n, 3^n | n \ldots 1\}$. |8|

OR

Q.4 (a) Explain the following:

(i) Turing Machine

(ii) Recursive and recursive enumerable language |8|

(b) Ackermann's function is defined by

$A(0, y) = y + 1.$ $A(x + 1, 0) = A(x, 1)$

$A(x + 1, y + 1) =$ $A(x, A(x + 1, y))$

Compute

(i) A (1,1) (ii) $A(2,1)$ (iii) $A(1,2)$ |8|

Unit-V

Q.5 Prove the following closure properties of context sensitive language. |4×4=16|

(a) Union (b) Intersection (c) Complementation (d) Transpose

OR

Q.5 (a) Which of the following are context sensitive grammar?

Given $V_N = \{S, A, B, D\}$

$S = \{0, 1, a, b, \}$. A is star symbol

(a) $A \rightarrow BB$

(b) $A \rightarrow 0B$

(c) $SA \rightarrow S0A$

(d) $SAB \rightarrow S0A1$

(e) $aABbcD \rightarrow abcDbcd$

(f) $01 \rightarrow 10$

(g) $aBA\ bCD \rightarrow abcD\ bcD$