6E3203

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B. Tech. VI Sem. (Main & Back) Exam., May/June-2014
Computer Engineering
6CS3 Theory of Computation
Common to CS & 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 may 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 basic concepts of finite state systems. Also explain the terms trap state, final state, non final state, & Initial state.   [16]
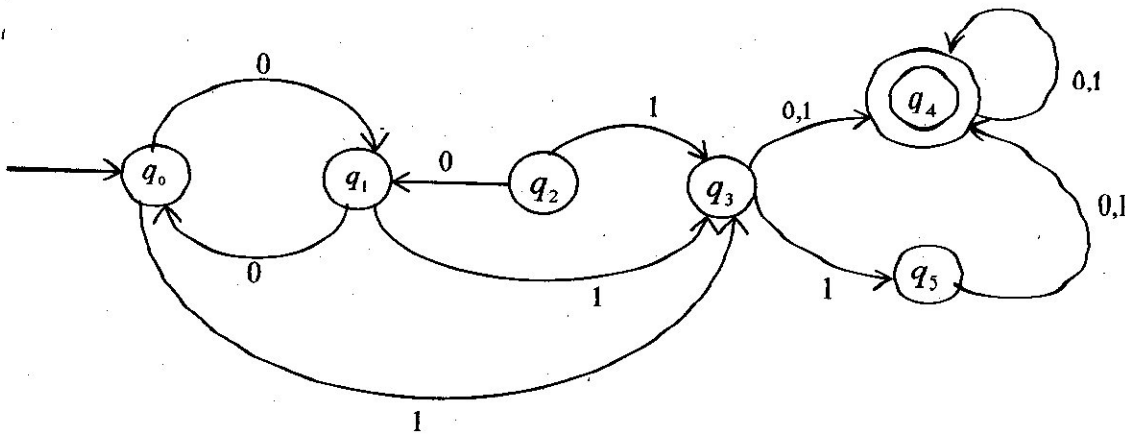
OR

Q.1 (a) Minimize the following finite automata. Also write procedure for minimization.

[10]

(b) Explain difference between deterministic and non deterministic finite Automata.

[6]

UNIT-II

Q.2 (a) State and explain pumping lemma for regular sets. Prove that following expression is regular or not regular using pumping lemma.

$$L = \{a^n b^m : n \leq m + 3\}$$

[8]

(b) Explain the concept of Regular sets and Regular grammar with the help of an example.

[8]

OR

Q.2 (a) Write down the closure properties of regular languages. Also describe Pigeon hole principle.

[8]

(b) Write down the regular expression and finite Automata / Transition Diagram for following languages over alphabets $\Sigma = \{a, b\}$

(i) Set of string that starts with "aa" and end with "ab".

(ii) Set of string that starts with "a" and ends with "b" and having at least one string of "abab". [4x2]

UNIT-III

Q.3 (a) What is push down automata? Design a push down automata for language

L = {$a^n b^n$: ≥ 1}, also check the acceptability of string "a aa b bb a b". [10]

(b) Explain Greiback normal form in detail. [6]

OR

Q.3 (a) Explain context free grammar and find the context free grammar for the following languages.

(i) L = {$a^n b^m$: $n \geq 1$} [6]

(ii) L = {$a^n b^m$: $n \leq m + 1$} [5]

(iii) L = {$a^n b^n$: $n > 0$} [5]

UNIT-IV

Q.4 (a) Explain Turing Machine. Also explain the difference between Multitape and Multidimensional Turing Machine. [10]

(b) Explain Rice's theorems in detail. [6]

OR

Q.4 (a) Design a Turing Machine that computes 2's complement of the given string over the Σ = {0, 1}. Also show the output of the machine for string "00000" [10]

(b) Write a short note on Universal Turing Machine in detail. [6]

UNIT-V

Q.5 (a) Explain context free grammar. Also differentiate it from context sensitive grammar. [8]

(b) Write short note on Chomsky Hierarchy of Languages in detail. [8]

OR

Q.5 (a) State and explain the linear bounded Automata. Also describe the organization of linear bounded Automata. [10]

(b) Explain the properties of Context – Sensitive languages. [6]

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