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Roll No. .....

TCS/TIT–405

B. TECH. (CS & IT) (FOURTH SEMESTER) MID SEMESTER EXAMINATION, 2018

THEORY OF COMPUTATION

Time : 1 : 30 Hours

Maximum Marks : 50

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Fill in the blanks : (1×5=5 Marks)

   (a) The transition function maps ..... in Deterministic Finite Automata.

   (b) The transition function maps ..... in Non-Deterministic Finite Automata.

   (c) Consider the regular expression (0 + 1) (0 + 1) .....*n* times. The minimum state finite automation that recognizes the language represented by this regular expression contains ..... states.

   (d) Given an arbitrary non-deterministic finite automation (NFA) with N states, the maximum number of states in an equivalent minimized DFA is .....

(e) The symbol "Δ" in FA with output denotes .....

2. Attempt any *five* parts : (3×5=15 Marks)

(a) What do you understand by Finite Automata ? Define its types with examples.

(b) How many substrings (of all lengths inclusive) can be formed from a character string of length n ? Assume all characters to be distinct. Prove your answer with an example.

(c) Define Finite Automata with output (Moore and Mealy machines).

(d) Define Set, Power Set and Subset with the help of examples.

(e) Write Pumping Lemma for regular language.

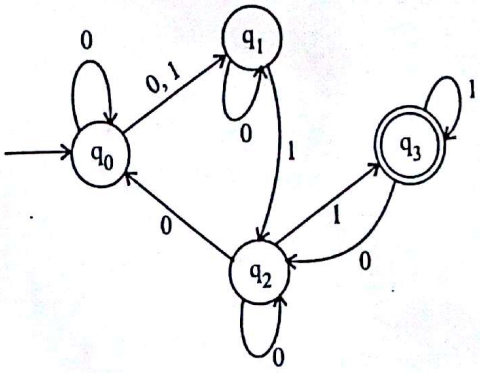
(f) Give the regular expression over {0, 1} to denote the set of proper non-null substrings of the string "0010".

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Explain the theory of automata, computability and complexity.

(b) Covert the following NFA into equivalent DFA :



(c) Design the DFA for the following regular expression :

$(0 + 11\ (1 + 0)^*\ 1 + 00 + 101)$

4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Give minimal DFA that performs as a Mod-3 1's counter, i. e., outputs a 1 each time the number of 1's in the input sequence is a multiple of 3.

(b) Draw a minimum state deterministic finite automation accepting the language L = {w|w belongs to {0, 1}*, number of 0's and 1's in w are divisible by 3 and 5}.

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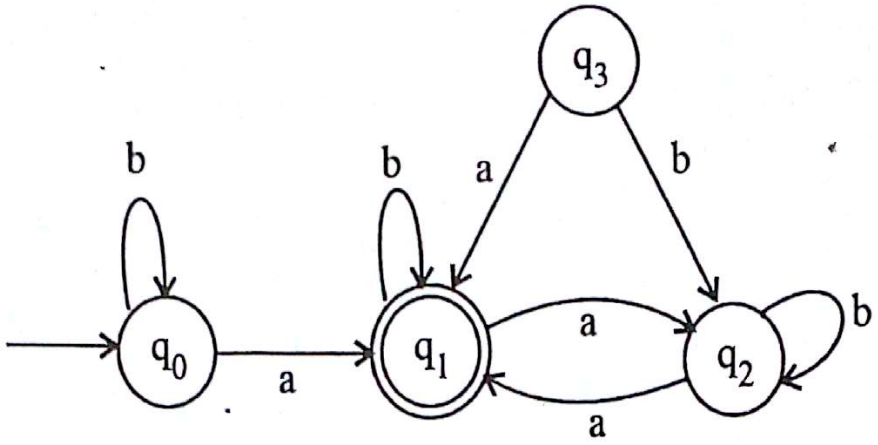
(c) Derive the regular expression of the following Finite Automata :



5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Design a Finite Automata to recognize the strings containing odd number of 0's and odd number of 1's over $\Sigma = \{0,1\}$.

(b) Design a DFA for the language over $\Sigma = \{0,1\}$ such that the Decimal equivalent of the Binary string is divisible by 3.

(c) Prove that the language $L = \{a^n b^n \ / \ n >= 1\}$ is not regular.