

TCS/TIT-405

B. TECH. (CS&IT) (FOURTH SEMESTER)

END SEMESTER EXAMINATION, 2019

THEORY OF COMPUTATION

Time : Three Hours

Maximum Marks : 100

Note :(i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Each part carries ten marks. Total marks assigned to each question are twenty.

(2)

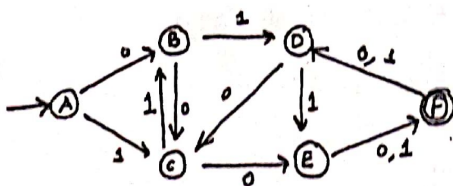
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1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

- (a) What do you understand by finite automata? Discuss the types of finite automata with suitable examples.
- (b) Define set and function. Explain the various types of function.
- (c) Write the steps of pumping lemma for regular languages.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

- (a) Design a DFA recognizing all signed floating point numbers. Also describe all the tuples of the is DFA.
- (b) Minimize the following DFA :



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- (c) Design a DFA over $\Sigma = \{a, b\}$ such that the strings starts with 'ab and third symbol from right is "a".

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

- (a) Design a moore machine to perform 2's complement of a given binary number. Also convert this to equivalent mealy machine.

- (b) Construct a DFA for the following regular expression :

$$R.E. = (01 + 10) 11 + 001 + 1^*0^*$$

- (c) Prove that the language $L = \{a^p/p \text{ is a prime no.}\}$ is not regular.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

- (a) Construct a CFG for accepting :

- (i) No. of a's are three times the no. of b's over $\Sigma = \{a, b\}$.

- (ii) Palindrome string over $\Sigma = \{0, 1\}$.

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(b) Construct a PDA for the following languages :

(i) $L = \{a^n b^m c^n / n, m \geq 1\}$

(ii) $L = \{a^i b^j c^k / i + k = j / i, j, k \geq 0\}$

(c) Write the pumping lemma for context-free language.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Design a Turing machine that recognizes the following language :

$$L = \{0^n 1^n 2^n / n > 1\}.$$

(b) Discuss the Halting problem in turing machine. Prove that it is undecidable with the help of diagonalization method.

(c) Explain the design variants of turing machine in detail.