Tribhuvan University

Institute of Science and Technology

2081

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Bachelor Level / Second Year/ Forth Semester/ Science — Full Marks: 60

Computer Science and Information Technology (CSC 257) — Pass Marks: 24

(Theory of Computation) — Time: 3 hours.

(OLD COURSE)

Candidates are required to give their answers in their own words as for as practicable.

All figures in the margin indicate full marks.

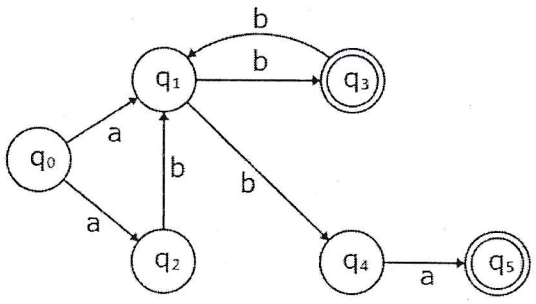
Section A

Long Answer Questions.

Attempt any TWO questions. **[2×10=20]**

1. Define regular expression with its operators. How do you convert DFA to regular expression? Explain with an example. [5 + 5]

2. What is finite state machine? Convert the following NFA to DFA, where q_0 is starting state. [2 + 8]



3. Design a PDA that accepts palindrome string over alphabet {a, b}, and convert it into CFG. [10]

Section B

Short Answer Questions

Attempt any EIGHT questions. **[8×5=40]**

4. Define alphabet, string and substring. [5]

5. When a grammar is said to be ambiguous? Remove the left recursion from the following grammar. [2 + 3]
   $A \rightarrow A01 \mid A1 \mid 00 \mid 11 \mid 0 \mid 1$

6. Define halting problem. Discuss about satisfiability problem with an example. [2 + 3]

7. Write the formal definition of Turing machine and define it as subroutine. [5]

8. What is counter machine? Differentiate between Turing machine and Universal Turing machine. [2 + 3]

9. Find out whether the language $L = \{x^n y^n z^n \mid n \geq 1\}$ is context free or not using Pumping lemma. [5]

10. Prove that every multi-tape Turing machine has an equivalent single-tape Turing machine. [5]

11. Convert the following grammar to GNF. [5]
    $S \rightarrow ABCD \mid aD$, $D \rightarrow BD \mid \in$, $A \rightarrow 0$, $C \rightarrow 1$

12. Define abstract and optimization problem. Discuss about Moore machine. [2 + 3]