

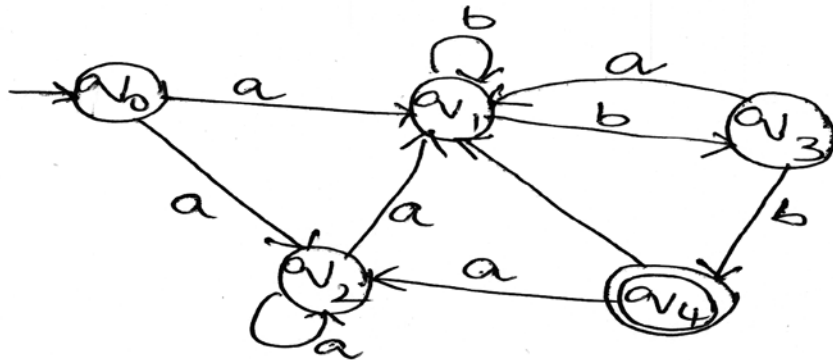
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Give DFA's accepting the following languages over the alphabet $\{0,1\}$:
 - (a) The set of all strings ending in 00.
 - (b) The set of all strings with three consecutive 0's (not necessary at the end).
 - (c) The set of strings with 011 as a substring.
- 2 (a) Construct a minimum state automata for following DFA.
(b) Explain the conversion steps in detail.



- 3 (a) Show that if L is a regular language and F is a finite language, the $L \cup F$, $L \cap F$, and $L - F$ are regular?
(b) Show that if L is a non-regular language and F is a finite language then F is non-regular.
- 4 Prove "Given a CFG $G = (V, T, P, S)$ we can effectively find an equivalent CFG $G^1 = (V^1, T, P^1, S)$ such that for each x in V^1UT there exists α and β in $(V^1UT)^*$ for which $S \Rightarrow \alpha * \beta$ ".
- 5 (a) Show that CFL's are closed under Kleen's closure operation.
(b) Check whether the following grammar is ambiguous or not. Provide at least two examples to support your answer:
 $S \rightarrow AB / aaB \quad A \rightarrow a / Aa \quad B \rightarrow b$.
- 6 (a) Construct a PDA for recognizing $L = \{a^{n+1}b^n / n \geq 0\}$. Show the moves of the PDA for the string aaaabbb.
(b) Distinguish between finite automata and push down automata.
- 7 Write short notes on:
 - (a) Recursively enumerable and recursive languages.
 - (b) FAs and TMs.
 - (c) Church's hypothesis.
- 8 (a) What is modified PCP? Does the following instance of MPCP has solution? If so, give the answer $w = (1, 10111, 10)$ and $x = (111, 10, 0)$.
(b) Explain about halting problem of Turing machine.
