

- N.B. (1) Question No. 1 is compulsory
(2) Attempt any three out of remaining five questions
(3) Assumptions made should be clearly stated

1. (a) Write short note on Myhill Nerode theorem 5
(b) Differentiate between NFA and DFA. 5
(c) State and explain Closure properties of Context Free Language 5
(d) Explain Post Correspondence problem. 5
2. (a) Construct the NFA- ϵ
i for the language in which strings starts and ends different letter over the set $\Sigma = \{a, b\}$ 10
ii for the R.E (01+2*) 10
(b) Give and Explain formal definition of Pumping Lemma for Regular Language and prove that following language is not regular. 10
$$L = \{ a^n b^m \mid 1 \leq n \leq m \}$$
3. (a) Convert the given grammar into Griebach Normal Form 10
$$S \rightarrow aSB \mid aA$$

$$A \rightarrow Aa \mid Sa \mid a$$

(b) Construct PDA for a language $L = \{wcw^R \mid w \in \{a,b\}^*$ and w^R is reverse of $w\}$ 10
4. (a) Construct TM to check palindrome over $\Sigma = \{0,1\}$ 10
(b) Design a DFA which accepts all strings not having more than 2 a's over $\Sigma = \{a, b\}$ 10
5. (a) Convert $(0+1)(01)^*(0+\epsilon)$ into NFA with ϵ -moves and obtain DFA. 10
(b) Design Mealy Machine that accepts an input from $(0+1)^*$ if the input ends in 101, output A; if the input ends in 110, output B, otherwise C. then convert into Moore Machine. 10
6. (a) Draw a parse tree for the string "abaaba" for the CFG given by G where 10
$$P = \{ S \rightarrow aSa$$

$$S \rightarrow bSb$$

$$S \rightarrow a \mid b \mid \epsilon \}$$

Also Determine whether the given CFG is ambiguous or not.
(b) Write short note on following 10
i) Halting problem
ii) Rice's Theorem