

Duration: 3 hours

Total marks: 80

Note (1) Question No. 1 is compulsory

- (2) Attempt any three questions from remaining questions
 (3) Draw suitable diagrams wherever necessary
 (4) Assume suitable data, if necessary

- Q 1. (a) Construct a DFA that accepts all the strings on $\{0, 1\}$ except those containing the substring 010. (05)
- (b) Find the CFG for the regular expression $(11)^*(010+01)^*$. (05)
- (c) Write short note on Chomsky Hierarchy. (05)
- (d) Give formal definition on NFA with epsilon. (05)
- Q 2. (a) Write NFA for accepting regular Expression $(b+ab)^*(ba^*+b)$. (10)
- (b) Design a Moore and Mealy machine for a binary input sequence such that if it has a substring 010 the machine outputs A if input has substring 101 it outputs B otherwise it outputs C. (10)
- Q 3 (a) Use pumping lemma to show that the set of palindromes is not a regular Language. (palindrome is a string that equals its own reverse, such as 0110). (10)
- (b) Minimize the following DFA where q_0 is a start state and q_1, q_2 and q_4 are final states. (10)

∂	0	1
q_0	q_3	q_1
q_1	q_2	q_5
q_2	q_2	q_5
q_3	q_0	q_4
q_4	q_2	q_5
q_5	q_5	q_5

Q 4 (a) Explain rules for simplification of CFG. (10)

(b) Convert given CFG to CNF (10)

$$S \rightarrow ASB \mid \epsilon$$

$$B \rightarrow SbS \mid A \mid bb$$

$$A \rightarrow aAS \mid a$$

Q 5 (a) Design a PDA to accept the language $\{L = a^m b^m c^n \mid m, n \geq 1\}$ (10)

(b) Construct TM for checking well formness of the parenthesis. (10)

Q 6 Write short notes on (Any two) (20)

(a) Pumping Lemma for Regular Languages

(b) Universal Turing Machine.

(c) Unsolvable Problems
