

[Time: Three Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question No. 1 is compulsory.
  2. Attempt any **three** out of remaining **five** questions.
  3. Assumptions made should be clearly stated.
  4. Figures to the right indicate full marks.
  5. Assume suitable data whenever required but justify that.

- Q.1
- a) Differentiate between NFA and DFA 5
  - b) Explain Chomsky Hierarchy 5
  - c) Explain Rice's Theorem 5
  - d) Explain Pumping Lemma for CFG 5
- Q.2
- a) Design FA to check divisibility by 3 to binary number. 10
  - b) Using Pumping Lemma prove that following language is not regular:  $L = \{ 0^m 1^{m+1} \mid m > 0 \}$  10
- Q.3
- a) Design Moore Machine to generate output A if string is ending with abb, B if string ending with aba and C otherwise over alphabet (a,b). And Convert it to Mealy machine. 10
  - b) Simplify the given grammar.  $S \rightarrow aAa/bBb/BB$   $A \rightarrow C$   $B \rightarrow A/S$   $C \rightarrow S/\epsilon$ . 10
- Q.4
- a) Construct NFA for Given Regular expressions: 10
    - i)  $(a+b)^*ab$ ,
    - ii)  $aa(a+b)^*b$ ,
    - iii)  $aba(a+b)^*$ ,
    - iv)  $(ab/ba)^*/(aa/bb)^*$
  - b) Construct PDA accepting the language  $L = \{ a^{2n}b^n \mid n > 0 \}$ . 10
- Q.5
- a) Design minimized DFA for accepting strings ending with 100 over alphabet (0,1). 10
  - b) Design Turing machine to recognize wellformedness of parenthesis. 10
- Q.6 Write short note on (any four) 20
- a) Greibach Normal form
  - b) Deterministic PDA and Multistack PDA
  - c) Variants of Turing Machine
  - d) Halting Problem
  - e) Church-Turing Thesis