

Duration : 3 hours

Total marks : 80



- N.B. (1) Question No. 1 is compulsory  
 (2) Attempt any three out of remaining five questions  
 (3) Assumptions made should be clearly stated
- Q. 1 a) Differentiate between NFA and DFA 5  
 b) Give regular expression for 5  
 i) Set of all strings over  $\{0, 1\}$  that end with 1 has no substring 00  
 ii) Set of all strings over  $\{0, 1\}$  with even number of 1's followed by odd number of 0's  
 c) Construct an NFA with epsilon transition for  $(00 + 11)^* (10)^*$  5  
 d) Give applications of regular expression and finite automata 5
- Q. 2 a) Construct PDA accepting the language  $L = \{a^n b^n \mid n \geq 1\}$  10  
 b) Design minimized DFA for accepting strings ending with 100 over alphabet  $\{0, 1\}$  10
- Q. 3 a) Convert following CFG to CNF 10

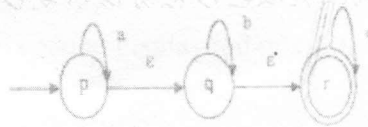
$$S \rightarrow ASA \mid aB$$

$$A \rightarrow B \mid S$$

$$B \rightarrow b \mid \epsilon$$

- b) Convert Moore and Mealy machine to find out 2's complement of a binary number 10

- Q. 4 a) Convert following  $\epsilon$ -NFA to NFA without  $\epsilon$  10



- b) Using pumping lemma prove that language 10

$L = \{0^n 1^n 2^n \mid n \geq 1\}$  is regular language or not

- Q.5 a) Design Turing machine that recognizes palindrome strings over  $\Sigma = \{0, 1\}$  10

- b) Define context free grammar. 10

Obtain the CFG for the regular expression  $(110 + 11)^* (10)^*$

- Q.6 Write short note on (any four) 20

- a) Halting problem  
 b) Universal Problem  
 c) Post correspondence problem  
 d) Chomsky Hierarchy  
 e) Differentiate between FSM and TM

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