

SE-comp.  
sem III (CBSGS)  
T.C.S.

15/12/14

QP Code :12552

(3 Hours)

[ Total Marks : 80

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

1. (a) Give chomsky hierarchy of grammar with examples. 5  
(b) State and explain any 5 closure properties of regular languages. 5  
(c) Compare recursive and recursively enumerable languages. 5  
(d) State and prove equivalence of NFA and DFA. 5
2. (a) Design a DFA to accept strings over the alphabet set  $\{a, b\}$  that begin with 'aa' but not end with 'aa'. 10  
(b) Convert  $(0 + \epsilon) (1 0)^* (\epsilon + 1)$  into NFA with  $\epsilon$ -moves and hence obtain a DFA. 10
3. (a) Design a MOORE and MEALY machine to decrement a binary number. 10  
(b) Give statement of pumping lemma for regular sets and hence prove that  $\{w c w^R \mid W \in (a + b)^*\}$  is not regular where  $w^R$  is reverse of  $w$ . 10
4. (a) Obtain leftmost derivation, rightmost derivation and derivation tree for the string "cccbacba". The grammar is  
 $S \rightarrow SSa \mid SSb \mid c$  10  
(b) Design Turing machine as generator to add two binary numbers and hence simulate for "110 + 10". 10  
Hint : Assume two way infinite tape.
5. (a) Design a PDA to accept language  $\{a^{n-1} b^{2n+1} \mid n \geq 1\}$ . 10  
(b) Convert the below given grammar to Chomsky Normal Form (CNF) and Griebach Normal Form (GNF) 10  
 $E \rightarrow E + E \mid E * E \mid (E) \mid id$   
Consider "id" as a single terminal/symbol.
6. (a) Design a Turing machine as acceptor for the language  $\{a^n b^m \mid n, m \geq 0 \text{ and } m \geq n\}$ . 10  
(b) Design PDA to check even parentheses over  $\Sigma = \{0, 1\}$  10