

SEM V (TCS)

CAMPUS (CBES)

15/12/2014

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 ϵ -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 "cccbaccba". 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