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DD-685

M.C.A. EXAMINATION, May 2017

(Fourth Semester)

(B. Scheme) (Main & Re-appear)

THEORY OF COMPUTATION

MCA-552

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Explain the following terms : production restriction, acceptor, derivation and FSM. Also give example for each. **6**

(b) Determine the DFA that accepts the language :

(i) L(aa* + aba* + b*)

(ii) L(ab(a + ab* (a + aa)) **9**

2. (a) Design NDFA with five states for $\{abab^n : n \geq 0\} \cup \{aba^n : n \geq 0\}$. **7**

(b) Give regular expression for (i) Zero or more (ii) Any string at all, where $\sum\{a, b, c\}$. **8**

Unit II

3. (a) State the closure properties of regular languages. **6**

(b) What is GNF ? How to convert a given grammar into GNF ? **9**

4. Obtain a grammar in CNF equivalent to the grammar G with productions P given :

$S \rightarrow aAbB$

$A \rightarrow aA \mid a$

$B \rightarrow bB \mid b$ **15**

Unit III

5. Design a Turning machine that accepts L = $\{a^n b^n\} \mid n \geq 0$. **15**

6. (a) What is a non-deterministic Turning machine ? **7**

(b) What is meant for empty production removal in push down automata ? **8**

Unit IV

7. (a) Show that $\{a, b\}^* - \left\{a^n b^{n^2}\right\} \mid n \geq 0$ is not context free. **9**

(b) What is a primitive recursive function and primitive recursion ? **6**

8. (a) What is unrestricted grammar ? What are some of its features ? **6**

(b) What are total function and partial function ? Show how a Turing machine may perform recursion ? **3+6**