Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   **Total No. of Pages : 02**

Total No. of Questions : 09

MCA (E-I) (2015 & Onwards) (Sem.–3)
THEORY OF COMPUTATION
Subject Code : MCA-305B
Paper ID : [74078]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTIONS-A, B, C & D contains TWO questions each carrying TEN marks each and students has to attempt any ONE question from each SECTION.**
2. **SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.**
3. **Use of non-programmable scientific calculator is allowed.**

SECTION-A

1. a. Write a short note on Venn Diagrams. (5)

 b. State and explain principle of Structural Induction. (3)

 c. What is complement of a language? Give one example (2)

2. a. Write and explain associative, commutative and distributive properties of regular sets.
 (5)
 b. *"Every regular set contains a regular subset"*. Justify the statement. (5)

SECTION-B

3. a. What are various steps involved in null moves removal? Write an example.

 b. Design an DFA generating L = {w | w is binary string divisible by 5}

4. a. State and explain pumping lemma for regular languages.

 b. Prove that L = {$a^n b^n$| where n is positive integer } is not regular.

SECTION-C

5. Compare the power of DPDA with NPDA. Also design a DPDA for language

   $\{a^m b^n \mid n=2m+1 \ \& \ \{a,b\}\varepsilon\sum\}$

6. a. What is the importance of Griebach Normal Form and Chomsky Normal Form? Give procedure to convert any given grammar to GNF and CNF.

   b. Explain acceptance criteria of PDA by null store and by final state.

SECTION-D

7. Design a Turing machine for language $\{a^n b^m c^{n\times m} \mid \{a,b,c\}\varepsilon\sum \}$

8. State and explain closure properties of Recursive Languages in detail.

SECTION-E

9. Write briefly :

   a. Roaster Notation of Set. Give two examples.

   b. What are LR(k) grammars?

   c. *"If a language is accepted by a DFA, it is always accepted by some DPDA"*. Comment on the statement.

   d. Draw a transition graph of DFA accepting set of binary strings ending with 001.

   e. Write briefly, the criterion for a language to be Context Free.

   f. Griebach Normal Form.

   g. Is every CFL closed under complementation?

   h. Post Correspondence Problems.

   i. State Rice theorem.

   j. Pigeonhole principle.