

7. (a) Construct a PDA equivalent to the following CFG. 10  
 $S \rightarrow \epsilon$   
 $S \rightarrow SS$   
 $S \rightarrow (S)$
- (b) Explain the instantaneous description of PDA. 6

**SECTION -**

8. (a) Design a T.M. which copies a string? 10  
 (b) Explain Universal Turing Machine. 6
9. (a) What are Primitive Recursive Functions? Explain with the help of example. 8  
 (b) Design a T.M. to compute  $m \times n$ , where  $m$  and  $n$  are positive integers. 8

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Roll No. ....

**67193**

**MCA 4th Semester CBCS Scheme  
 w.e.f. 2017-18  
 Examination – May, 2018**

**THEORY OF COMPUTATION**

Paper : 17MCA34DA1

*Time : Three Hours ]*

*[ Maximum Marks : 80*

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

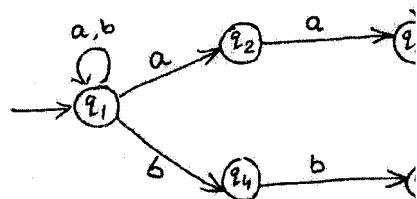
*Note : Question No. 1 is compulsory. Attempt five questions in total selecting one question from each Unit.*

1. Explain the following : 2 × 8 = 16
- (a) What is dead state? Give an example.  
 (b) Two differences between DFA and NFA.  
 (c) Define Context-Sensitive Language.  
 (d) List and explain four components used to form a context free grammar.

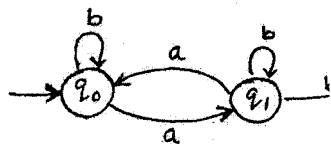
- (e) Draw and explain the block diagram of TM.
- (f) Explain PDA mathematical notation.
- (g) Is the halting problem recursive?
- (h) What is the usage of Pumping Lemma for CFL?

**SECTION -**

2. (a) Construct DFA equivalent to the following NFA. 8



- (b) Construct the Regular Expression from the following state diagram. 8



- 3. (a) Explain Moore and Mealy machines with the help of examples. 4
- (b) Explain the Recursive definition of Regular expression. 4
- (c) Prove that every NFA has an equivalent DFA. 8

**SECTION - B**

4. (a) Convert the grammar in CNF. 8
- $$S \rightarrow bA \mid aB$$
- $$A \rightarrow bAA \mid aS \mid a$$
- $$B \rightarrow aBB \mid bS \mid b$$
- (b) Construct an equivalent reduced grammar of the following grammar. 8
- $$S \rightarrow AACD$$
- $$A \rightarrow aAb \mid \epsilon$$
- $$C \rightarrow aC \mid a$$
- $$D \rightarrow aDa \mid bDb \mid \epsilon$$

5. (a) Convert the following CFG into GNF. 12
- $$S \rightarrow AB$$
- $$A \rightarrow BS \mid a$$
- $$B \rightarrow SA \mid b$$
- (b) Explain the Ambiguity in CFG with the help of an example. 4

**SECTION - C**

6. (a) Construct a PDA for the language : 8
- $$L = \{a^m b^m c^n \mid m, n \geq 1\}$$
- (b) Prove the pumping lemma for CFL. 8