

Roll No. 

Total No. of Pages : 02

Total No. of Questions : 09

**MCA (2014 Batch) (Sem.-3)**  
**THEORY OF COMPUTATION**  
Subject Code : MCA-305B  
M.Code : 70777

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. SECTIONS-A, B, C & D contains TWO questions each carrying TWENTY 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.

**SECTION-A**

1. a) Show, by mathematical induction that for all  $n \geq 1$ .

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

- b) What is an equivalence relation? Explain with an example.
2. Design a finite automata for accepting the strings generated over  $\Sigma = \{0, 1\}$  having even number of 0s and 1s.

**SECTION-B**

3. What is  $\epsilon$ -transition? Give an example of an automata having two different final states (other states may be taken as per your choice) and both of them have incoming  $\epsilon$ -transitions. How will you remove the  $\epsilon$ -transitions?
4. What is pumping lemma for regular languages? Use it to prove that the language  $L = \{0^n 1^n : n \geq 1\}$  is not regular.

**SECTION-C**

5. Design a Push Down automata for accepting the language  $L = \{0^n 1^n : n \geq 1\}$ .
6. Justify the statement : “The intersection of two context-free language may not be a context-free language”.

**SECTION-D**

7. Design a Turing Machine for the addition of two numbers.
8. What is a recursive language? Give argument(s) in support of the statement : “*Recursive languages are closed under complementation*”.

**SECTION-E****9. Answer briefly :**

- a) Is the expression  $(1^* - \epsilon)$  regular? Justify your answer.
- b) What is structural Induction?
- c) State Kleen's Theorem.
- d) Give an example of a regular grammar.
- e) What is a derivation tree?
- f) What is deterministic push down automata?
- g) What is parsing?
- h) Give the CFG for the language  $L = \{0^n 1^n : n \geq 0\}$ .
- i) What is partial function?
- j) Give an example of CSG.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**