00782

No. of Printed Pages : 3

CS-73

BACHELOR OF COMPUTER APPLICATIONS (BCA)
(Pre-Revised)

Term-End Examination, 2019

CS-73 : THEORY OF COMPUTER SCIENCE

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

Note : Question number **1** is **compulsory**. Attempt **any three** questions from the rest.

1. (a) Prove that the language $L = \{0^k : k \text{ is a prime number}\}$ is not regular. [5]

   (b) Construct a non-deterministic Finite automata accepting the set of all strings over {a, b} ending in aba. Use it to construct a DFA accepting the same set of strings. [5]

   (c) Design a CFG for the language $L = \{a^n b^m : n \neq m\}$. [5]

   (d) Construct a PDA for the language $L = \{a^n b^{3n} / n \geq 1\}$. [5]

(e) Construct a Turing Machine to accept the set L of all strings over {0, 1} ending with 010. [5]

(f) Show that : [2.5+2.5=5]

(i) $an + b = O(n^2)$

provided $a > 0$.

Make necessary assumptions.

(ii) $n \log n + n = O(n^2)$

2. (a) Design the NFA for the language. [8]

$$L = (ab \cup aba)^*$$

(b) If L is regular set over $\sum$ then $\sum^* - L$ is also regular over $\sum$. [7]

3. (a) Write the CFG which generates strings having equal no. of a's and b's. [8]

(b) Show that the following grammar is ambiguous[7]

$$S \rightarrow AB \mid aaB$$

$$A \rightarrow a \mid Aa$$

$B \rightarrow b$

4. (a) Explain the following with example : [5+5=10]

(i) Non-Deterministic Turing Machine

(ii) Post-Correspondence Problem

(b) Write a short note on Turing Machine Halting Problem. [5]

5. (a) What is the importance of NP Complete Problem. Prove that SAT is NP-Complete. [10]

(b) Show that the growth rate of any exponential function is greater than that of any polynomial function. [5]

----- x -----