

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2023
(Regular/Improvement/Supplementary)

COMPUTER SCIENCE
FCSS1C03 – THEORY OF COMPUTATION

Time: 3 Hours

Maximum Weightage: 30

Section A: Short answer questions. Answer any *four* questions. Each carries *two* weightage.

1. Construct a DFA which accepts all strings of 0's and 1's in which both the number of 0's and the number of 1's are even.
2. Prove that the class of regular sets is closed under complementation.
3. Define Context Free Grammar with examples.
4. State Myhill Nerode theorem.
5. Find a Turing Machine to accept $\{0^n 1^n / n \geq 1\}$.
6. What is homomorphism?
7. Find a regular grammar that generates the language $L(aa^*(ab+a)^*)$.

(4 × 2 = 8 weightage)

Section B: Short essay questions. Answer any *four* questions. Each carries *three* weightage.

8. Explain the closure properties of Regular Languages in TOC?
9. Write a note on Chomsky Hierarchy.
10. Explain CNF and GNF with examples.
11. Prove that the post correspondence problem is undecidable.
12. Distinguish between decidable and undecidable problems. Prove that it is undecidable whether a Turing Machine halts on all inputs.
13. Show that the following grammar is ambiguous.
 $\{S \rightarrow aSbS/bSaS/\epsilon\}$
 $\{S \rightarrow AB/aaB, A \rightarrow a/Aa, B \rightarrow b\}$
14. Describe Non Deterministic Finite Automata.

(4 × 3 = 12 weightage)

(P.T.O.)

Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.

15. Discuss Finite Automata with Epsilon transitions in detail.
16. Show the equivalence of LBA and Context Sensitive Grammar (CSG) with examples.
17. State and prove Pumping Lemma of CFG.
18. Discuss on the various types of Turing Machines.

(2 × 5 = 10 weightage)