

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025
(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. Define Alphabets, Strings and Languages.
2. What are Epsilon Transitions?
3. State Equivalence Theorem.
4. Define regular expression. Write regular expression for all strings over $\{0, 1\}$ ending in '11' and contain at least one '0'.
5. What are Context Sensitive Grammars (CSG)?
6. Explain about Non Deterministic Turing Machine.
7. What is Cook's theorem?

(4 × 2 = 8 weightage)

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

8. What is mathematical induction? For all $n \geq 1$, prove that $1+3+5+\dots+2n-1 = n^2$.
9. Describe about the closure properties of Regular Languages.
10. Write down the steps for conversion of a Context Free Grammar to Chomsky Normal Form. Convert the following grammar into CNF (show each step).
$$S \rightarrow ASB \quad A \rightarrow aAS \mid a \mid \epsilon \quad B \rightarrow SbS \mid A \mid bb.$$
11. State the theorem for Pumping Lemma of regular languages. Prove that $L = \{a^i b^i \mid i \geq 0\}$ is not regular.
12. Describe about Turing decidable and Turing enumerable languages.
13. State the Post Correspondence problem. Explain.
14. Briefly explain PushDown Automata.

(4 × 3 = 12 weightage)

(P.T.O.)

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

15. Show the equivalence of DFA and NFA with an example.
16. Outline Chomsky hierarchy of grammar. Give examples for each.
17. Explain the classes P and NP completeness.
18. How minimization of DFA is done using Myhill-Nerode theorem? Explain with an example.

(2 × 5 = 10 weightage)