

Roll No.

Total Pages : 03

MCA/M-24

24524

THEORY OF COMPUTATION

MCA-20-25(i)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

1. Answer the following questions in brief : **5×3=15**

- (a) List the main application of pumping Lemma in CFL's.
- (b) Define Godel Numbering.
- (c) Given the alphabet set $\Sigma = \{0, 1\}$. Derive Regular Expression for Language L1 where all words must start with 0 and end with 1.
- (d) What are Recursively Enumerable Languages ?
- (e) What is the difference between primitive recursive function and recursive function ?

Unit I

2. Explain Pumping Lemma in detail. Use it to prove that

$L = \{a^i b^i \mid i \geq 0\}$ is not regular. **15**

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3. (a) What are the closure properties of Regular languages ? **6**
- (b) Construct a DFA with $\Sigma = \{a, b\}$, that accepts those strings which has even number of 'a' and even number of 'b'. **9**

Unit II

4. Define Context-free grammar. Construct a Context-free grammar G generating all integers. **15**
5. (a) Design a PDA for accepting a language $\{0^n 1^m 0^n \mid m, n \geq 1\}$. **6**
- (b) Explain whether the given grammar G is ambiguous or not : **9**
- (i) $E \rightarrow E + E$
- (ii) $E \rightarrow E - E$
- (iii) $E \rightarrow id$

Unit III

6. Define Turing Machine. Construct a Turing machine for $L = \{0^n 1^n \mid n \geq 1\}$. **15**
7. What are Linear Bound Automata ? Compare Linear Bound Automata and Pushdown Automata in detail. **15**

Unit IV

8. Write short notes on the following :
- (a) Post's correspondence problem
- (b) Cook's Theorem.
9. What are undecidable problems ? Is the Halting Problem Decidable ? Justify your answer. **15**