

(3 Hours)

[Total Marks: 80]

N.B. (1) Question No. 1 is compulsory**(2) Attempt any three out of remaining five questions****(3) Assumptions made should be clearly stated**

1. (a) Explain post correspondence problem. 5
 (b) Differentiate between FA and PDA. 5
 (c) Define Regular Expression and obtain a regular expression such that 5
 $L(R) = \{ w \mid w \in \{0, 1\}^* \text{ with at the most three zeros} \}$
 (d) What is ambiguous grammar? Check whether following grammar is ambiguous or not 5

$$E \rightarrow E + E \mid E * E \mid (E) \mid id$$

2. (a) Design a Finite State Machine to accept following language over the alphabet $\{0, 1\}$ 10
 $L(R) = \{ w \mid w \text{ starts with 0 and has odd length or starts with 1 and has even length} \}$

- (b) Give and explain formal definition of Pumping Lemma for Regular Language and prove that following language is not regular. 10

$$L = \{ 0^i \mid i \text{ is prime number} \}$$

3. (a) Construct PDA accepting the language $L = \{ a^{2n}b^n \mid n \geq 0 \}$ 10
 (b) Consider the following grammar 10

$$S \rightarrow i C t S \mid i C t S e S \mid a$$

$$C \rightarrow b$$

For the string 'ibtaeibta' find the following:

- (i) Leftmost derivation
 (ii) Rightmost derivation
 (iii) Parse tree
 (iv) Check if above grammar is ambiguous.

4. (a) Construct PDA to check $\{wcw^R \mid w \in \{a,b\}^*\}$ where w^R is reverse of w & c is a constant. 10
 (b) Convert following CFG to CNF 10

$$S \rightarrow 0A0 \mid 1B1 \mid BB$$

$$A \rightarrow C$$

$$B \rightarrow S \mid A$$

$$C \rightarrow S \mid \epsilon$$

5. (a) Convert $(0+1)(10)^*(0+1)$ into NFA with ϵ -moves and obtain DFA. 10
 (b) Construct Moore and Mealy Machine to convert each occurrence of 101 by 111. 10

6. Write short note on following (any 2) 20

- (a) Chomsky Hierarchy
 (b) Halting Problem
 (c) Rice's Theorem
 (e) Universal Turing Machine

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Correction in 1T00725 - T.E.(Computer Engineering)(SEM-V)(Choice Base) / 31904 - Theory of Computer Science

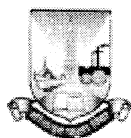
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Q.P. Code: **78070**

Q.1 d Consider the following string
 $id + id * id$

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