Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

End Semester Examination

November 2018

Max. Marks: 60 **Duration: 03 hr**

Class: T.E. **Semester: V**

Course Code: IT54/CE55 **Branch: IT/Computer Engineering**

Name of the Course: Theoretical Computer Science

Instruction:

(1) All questions are compulsory

(2) Draw neat diagrams

(3) Assume suitable data and state your reason

Q No.		Max. Marks	CO
Q.1 (a)	Using Pumping Lemma prove that the following languages are not regular 1. $L = \{O^i \mid i, \text{is prime number}\}$ 2. $L = \{WW \mid, W \in (a,b)\}$	06	CO2
Q.1 (b)	Check whether following PCP have solution? Justify your answer. 1. A = { 10,011,101} and B = {101,11,011} 2. A = { 1,10111,10} and B = {111,10,0}	06	CO4
Q.2 (a)	Give the technical strategy to convert CFG to GNF and Covert the following grammar in Greibatch normal form $A_1 \rightarrow A_2A_3$ $A_2 \rightarrow A_3A_1 \mid b$ $A_3 \rightarrow A_1A_2 \mid a$	06	CO3
Q.2 (b)	Design Equivalent PDA for $E \rightarrow E + E \mid E * E \mid id$	06	CO3
Q.3 (a)	Design PDA for strings containing equal numbers of a's and b's **OR** Design PDA for $L = \{WCW^R \mid W \in (a,b)^*\}$.	06 06	CO4 CO4
Q.3 (b)	Let G be the grammar, Find leftmost derivation, Rightmost derivation and parse tree for the string 00110101, 011101111 $S \rightarrow 0B \mid 1A$ $A \rightarrow 0 \mid 0S \mid 1AA$ $B \rightarrow 1 \mid 1S \mid 0BB$	06	CO3

Q.4 (a)	Design Turing machine to compare two numbers m and n such that input $= 0^m 10^n$ output $= \begin{cases} G, \text{if m is greater than n} \\ E, \text{if m equals n} \\ L, \text{if m less than n} \end{cases}$ OR	06	CO4
	Design Turing machine to recognize palindrome over Σ (a,b).	06	CO4
Q.4 (b)	Write Arden's theorem and find the regular expression that contain odd number of a's over Σ (a,b). OR Design Moore machine to "print residue modulo 4 for binary numbers", Convert the Moore machine to Mealy machine.	06 06	CO1 CO1
Q.5	Write short note on 1. Halting Problem 2. Recursive and Recursively Enumerable languages 3. Chomsky Hierarchy	 04 04 04	 CO4 CO2 CO4 CO3

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