

**K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22**  
**(Autonomous College Affiliated to University of Mumbai)**

Subject Code: CEC501

Subject Name: Theory of Computer Science

Date: 30-11-2022

Nov Dec 2022				
(B.Tech) Program: Computer Engineering				
Examination: TY Semester: V				
Course Code: CEC501 and Course Name: Theory of Computer Science				
Duration: 2.5 Hours		Max. Marks: 60		
Instructions:				
(1) All questions are compulsory.				
(2) Draw neat diagrams wherever applicable.				
(3) Assume suitable data, if necessary.				
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Define the following terms with example a) NFA b) DFA	2	CO1	U
ii)	Determine the number of states in the minimum sized DFA that accepts the language defined by the regular expression $(0+1)^*(0+1)(0+1)^*$ ? Justify this with short explanation	2	CO2	AP
iii)	Define the following terms a) Alphabet b) String	2	CO1	U
iv)	Why Context free grammar is placed in Type 2 grammar? Justify with valid reason	2	CO3	An
v)	Identify the false statement from given set of statements S1- Every NFA can be converted to an equivalent PDA S2- Every nondeterministic PDA can be converted to an equivalent deterministic PDA	2	CO4	An
vi)	Write in short which language is accepted by Turing machine	2	CO5	U
vii)	List down the limitations of Turing Machine	2	CO5	U
viii)	What is undecidability?	2	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Construct DFA for language defined by $\Sigma=\{0,1\}$ where a) $S=\{\text{strings ending with 0 always}\}$ b) $S=\{\text{strings representing odd binary numbers}\}$	4	CO1	An

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ii)	Give the regular expression for the following languages a) The set of strings over the alphabet {a,b} starting with b and ending with odd number of a's or even number of b's b) The set {10,1010}	4	CO2	An
iii)	Write a short note on Greibach Normal Form	4	CO3	U
iv)	Construct a PDA that accepts all palindrome strings over $\Sigma=\{a,b\}$	4	CO4	An
v)	Construct Turing machine for 1's complement of binary number	4	CO5	An
vi)	Explain about post correspondence problem	4	CO6	U
Q.3	Solve any two questions out of three.	16		
i)	Design a Finite State Machine to accept following language over the alphabet {0,1} $L(R)=\{w w \text{ starts with } 0 \text{ and has odd length or starts with } 1 \text{ \& has even length}\}$	8	CO1	An
ii)	What are different types of PDA. Design a PDA that accepts $\{a^n b^m   n \geq m\}$	8	CO4	Ap
iii)	Construct TM for $L=\{\text{all string's with equal number of a's \& b's}\}$	8	CO5	Ap
Q.4	Solve any two questions out of three.	16		
i)	With respect to properties of regular language explain what is pumping lemma and closure properties of regular language?	8	CO2	U
ii)	Write an equivalent left-linear grammar for the right linear grammar $S \rightarrow 0A   1B$ $A \rightarrow 0C   1A   0$ $B \rightarrow 1B   1A   1$ $C \rightarrow 0   0A$	8	CO4	AP
iii)	Let $HALT_{TM} = \{ \langle M, W \rangle \text{ where } M \text{ is a TM and } M \text{ halts on input } W \}$ prove that $HALT_{TM}$ is undecidable	8	CO6	Ap

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