

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

May 2025		Scheme :III
B.Tech. (Computer Engineering)		Semester :IV
Regular Examination :SY		Course Name: Theory of Computer Science
Course Code: <u>CEC 404</u>		Max. Marks: 60
Date of Exam: <u>26/05/2025</u>		Duration: 02.5 Hours

**Instructions:**

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any <b>two</b> questions out of three: (05 marks each)	10		
a)	Differentiate between FA and NFA.		CO1	U
b)	Give regular expressions for all strings containing no more than two a's followed by more than three b's on $\Sigma = \{a, b\}$		CO2	Ap
c)	Design PDA for $a^n b^{n+1}$ for $n \geq 1$		CO4	Ap
Q 2	Solve any <b>two</b> questions out of three: (05 marks each)			
a)	Differentiate between PDA and NPDA		CO4	U
b)	Construct a Turing Machine for language $L = \{ww^R \mid w \in \{0,1\}^*\}$		CO5	Ap
c)	Explain Rice Theorem.		CO6	U
Q.3	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	Design DFA for the language accepting strings ending with 'abb' over input alphabets $\Sigma = \{a, b\}$ .		CO1	Ap
b)	Explain Closure properties of Regular languages.		CO2	U

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c)	Consider the following grammar $S \rightarrow i C t S \mid i C t S e S \mid a$ $C \rightarrow b$ For the string <b>ibtaeibta</b> find the following: (i) Leftmost derivation (ii) Rightmost derivation (iii) Parse tree (iv) Check if above grammar is ambiguous.		CO3	Ap
Q.4	Solve any <b>two</b> questions out of three. (10 marks each)	20		
a)	Design a DFA which can accept a ternary number divisible by 2		CO1	Ap
b)	Give and Explain formal definition of Pumping Lemma for Regular Language and prove that following language is not regular.  $L = \{ a^m b^m \mid m > 0 \}$		CO3	Ap
c)	Design a Turing machine for well formedness of parenthesis.			AP

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