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

May-June 2025/ Nov – Dec 20_ July-Aug 20__ / Feb– March 20__
B. Tech Program: Information Technology   Scheme : III
~~Regular~~/Supplementary Examination: SY Semester: IV
04/08/2025 Course Code: ITC404 and Course Name: Automata Theory
Date of Exam: ~~26-05-2025~~   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.

Qu. No.	Question	Max. Marks	CO	BT level
Qu-1	Solve any **TWO** questions out of three: (05 marks each)	10		
a)	Explain the phases of Compiler with Neat diagram.	5	CO6	2
b)	Describe formal definition of Context Free Grammar with Tuple Notation.	5	CO3	2
c)	Explain Closure Properties of Regular Language.	5	CO1	2
Qu-2	Solve any **TWO** questions out of three: (05 marks each)	10		
a)	Design Finite Automata for aa* + bb*.	5	CO2	6
b)	Construct the PDA to accept the following language: $L= \{ww^R \mid w \in \{a,b\}\}$	5	CO4	6
c)	Design Turing machine for 2's complement of a given Binary number.	5	CO5	6
Qu-3	Solve any **TWO** questions out of three. (10 marks each)	20		
a)	i) Design the grammars for the languages $L = \{w \mid (w \mid \mod 3 = 0)\}$ on $\sum = \{a\}$ and use it to derive any valid string.	4	CO1	6
	ii) Is the Grammar $G =\{S \rightarrow AB, B \rightarrow ab, A \rightarrow aa, A \rightarrow a, B \rightarrow b\}$ ambiguous? Prove.	6	CO3	3
b)	Design PDA to accept the language $L = \{a^n b^{2n} \mid n \geq 1\}$.	10	CO4	6
c)	Construct a mealy machine for regular expression $(0+1)^*(00+11)$.	10	CO2	6
Qu-4	Solve any **TWO** questions out of three. (10 marks each)	20		
a)	Design FA that accepts either 000 or 010.	10	CO2	6
b)	I) Let G be the grammar S -> aB | bA A -> a | aS |bAA B -> b | bS | aBB For the string "bbaaabbaba" find	6	CO3	3

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	i) Left most derivation ii) Rightmost derivation iii) Parse tree			

	II) Write the regular expression corresponding to each of the following subsets of {a,b}
	  i) The set of all string containing the substring aa.
	  ii) The set of all strings containing exactly 2a's.
		4	CO1	3

c)	Construct a Turing machine which adds two unary numbers.	10	CO5	6

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