

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

May-June 2026		
B. Tech Program: Information Technology Scheme: III		
Regular/Supplementary Examination: SY Semester: IV		
Course Code: ITC404 and Course Name: Automata Theory		
Date of Exam: 26-05-2026	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)	Draw a diagram of the phases of a compiler and explain the Code optimizer and Code generation stages with suitable examples.	5	CO6	2
b)	Explain the Chomsky hierarchy for languages.	5	CO3	2
c)	Find Regular Expression corresponding to each of the following subsets of {a, b}. i. The set of all strings containing exactly 2a's ii. The set of all strings containing at least 2a's iii. The set of all strings containing substring aa.	5	CO1	3
Qu-2	Solve any TWO questions out of three: (05 marks each)	10		
a)	Design Finite Automata for $aa^* + bb^*$.	5	CO2	6
b)	Differentiate between Finite Automata and Pushdown Automata.	5	CO4	4
c)	Write short note on "Power of Turing Machine".	5	CO5	2
Qu-3	Solve any TWO questions out of three. (10 marks each)	20		
a)	i) Explain the closure properties of regular languages, and illustrate any one closure operation with a suitable example.	4	CO1	2
	ii) For the Grammar G, which is defined as: $S \rightarrow aB \mid bA$ $A \rightarrow A \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid ABB$ Where S is the start symbol, give the leftmost and rightmost derivations for the string 'bbaaba'.	6	CO3	3
b)	Construct a PDA M accepting $\{0^n 1^m 0^n \mid m, n \geq 1\}$ by null store.	10	CO4	6
c)	Design a Mealy Machine to find the 2's complement of a given binary number.	10	CO2	6

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Qu-4	Solve any TWO questions out of three. (10 marks each)	20		
a)	Design a NFA for the language $L = \text{all strings over } \{0,1\} \text{ that have at least two consecutive 0's or 1's.}$	10	CO2	6
b)	i) Construct a grammar in Greibach Normal Form (GNF) equivalent to the grammar: $S \rightarrow AA \mid a$ $A \rightarrow SS \mid b$	6	CO3	6
	ii) Describe in English the set denoted by following regular expressions: i. $\{11+0\}^*(00+1)^*$ ii. $(1+01+001)^*(\epsilon+0+00)$	4	CO1	3
c)	Design TM to accept the language $L = \{ a^n b^n \mid n \geq 1 \}$	10	CO5	6
