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

May-June 2026
(B. Tech) Program: Computer Engineering Scheme III
Regular Examination: SY Semester: IV
Course Code: CEC404 and Course Name: Theory of Computer Science
Date of Exam: Duration: 02.5 Hours Max. Marks: 60

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 **two** questions out of three: (05 marks each)	10		
a)	Construct Moore machine to find out the residue-modulo-3 for binary numbers.		CO1	AP
b)	Convert following CFG to GNF : S -> aSb | aX X-> Xa | Sa | a		CO3	Ap
c)	Design RE for the following i. Set of all string over $\sum = \{0,1\}$ that end with 1 and has no substring 00 (3M) ii. Set of all strings over $\sum = \{0,1\}$ with even number of 1's followed by odd number of 0's. (2M)		CO2	AP
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Design PDA for recognizing L= $\{a^m b^n c^n d^m \mid m, n>=1\}$		CO4	Ap
b)	Design Turing machine that accepts the string over $\sum = \{0,1\}$ and converts every occurrence of 111 to 101.		CO5	AP
c)	Describe recursive, recursively enumerable, and undecidable languages.		CO6	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Design Turing machine to perform subtraction of two unary numbers.		CO5	AP
b)	i. Explain decision properties of regular languages. (5M)		CO2	U

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	ii. Explain pumping lemma of a regular language with as example (5M)			
c)	Convert following NFA with epsilon to NFA without epsilon over $\sum = \{0,1,2\}$		CO1	AP

Q\∑	ε	0	1	2
Q0	Q1	Q0	-	-
Q1	Q2	-	Q1	-
Q2	-	-	-	Q2

Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Design the DFA to accept all the binary strings over $\sum=\{0,1\}$ that are beginning with 1 and having its decimal value multiple of 5.		CO1	AP
b)	Convert following PDA to CFG $\delta(q0, a,Z0)=(q0, ZZ0)$ $\delta(q0, a,Z)=(q0, ZZ)$ $\delta(q0, b,Z)=(q1, Z)$ $\delta(q1, b,Z)=(q1, Z)$ $\delta(q1, a,Z)=(q1, \varepsilon)$ $\delta(q1, \varepsilon,Z0)=(q1, \varepsilon)$		CO3	AP
c)	Describe any all variants of Turing Machine with neat diagrams		CO5	U

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