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

May-June 2024
(B.Tech) Program: Information Technology Scheme I/II/IIB/III: IIB
Supplementary ~~Regular~~ Examination: SY Semester: IV
Course Code: ITC404 and Course Name: Automata Theory
Date of Exam: 01/08/2024 **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	BTL
Qu-1	Solve any **SIX** questions out of **EIGHT.**	**12**		
i)	Differentiate between left linear grammar and right linear grammar	**2**	CO1	**3**
ii)	Define Nondeterministic Finite Automata in formal mathematical form	**2**	CO2	**1**
iii)	What do you mean by ambiguous grammar?	**2**	CO3	**1**
iv)	What are PUSH an POP operations of Pushdown Automata?	**2**	CO4	**2**
v)	What do you mean by automata as acceptor, transformer?	**2**	CO5	**2**
vi)	What is the backend and frontend of the compiler?	**2**	CO6	**2**
vii)	What are the limitations of finite automata?	**2**	CO2	**2**
viii)	Define Turing Machine formally.	**2**	CO5	**1**
Qu-2	Solve any **FOUR** questions out of **SIX**.	**16**		
i)	Describe in plain English language denoted by regular expression (0+1)*101(0+1)*	**4**	CO1	**2**
ii)	Differentiate between Deterministic and Nondeterministic Finite Automata	**4**	CO2	**3**
iii)	Prove that the following grammar is ambiguous $S \rightarrow aS \mid aSbS \mid \epsilon$	**4**	CO3	**2**
iv)	Explain Chomsky Hierarchy.	**4**	CO4	**2**
v)	What is halting problem? Explain with suitable example.	**4**	CO5	**2**
vi)	List the phases of complier and explore the Lexical Analyzer phase of compiler.	**4**	CO6	**2**
Qu-3	Solve any **TWO** questions out of **THREE**.	**16**		

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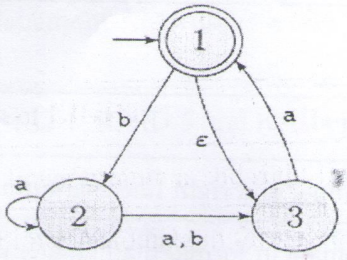
i)	State and Explain closure properties of Regular languages	**8**	CO1	**2**
ii)	Convert the NFA shown in Figure-1 into an equivalent DFA.  Figure-1: NFA	**8**	CO2	**3**
iii)	Convert the following grammar G into Greibach Normal Form (GNF). S→ XA|BB B→ b|SB X → b A → a	**8**	CO3	**3**
Qu-4	Solve any **TWO** questions out of **THREE**.	**16**		
i)	Design PDA for L={ $a^n b^n$ | n≥1}.	**8**	CO4	**5**
ii)	Design TM to accept the language L = {$a^n b^n c^n$ | n ≥ 1}.	**8**	CO5	**5**
iii)	Let L be the language of balanced strings of parentheses and the CFG for the language of balanced strings of parentheses is given with productions S → [S] | SS | ϵ Design a nondeterministic top-down PDA corresponding to the given CFG.	**8**	CO4	**5**

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