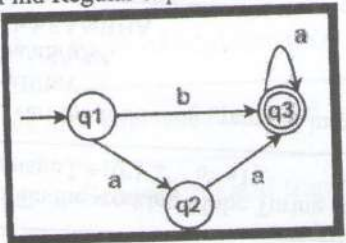


K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024		Program: B.Tech- COMP	Scheme II II B
Regular/ Examination: TY		Semester: V	Course Code: CEC501
Date of Exam: 22-11-2024		Course Name: Theoretical Computer Science	Max. Marks: 60
		Duration: 2.5 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 two questions out of three: (05 marks each)	10	
a)	State and prove Halting problem.		CO6 U
b)	Design Moore machine to o/p i) A if i/p ends in 101 ii) B if i/p ends in 110 iii) Otherwise o/p C over input = {0,1}		CO1 Ap
c)	Design PDA that accepts the language $L = \{a^n b^m a^n, m, n \geq 1\}$.		CO4 U
Q 2	Solve any two questions out of three: (05 marks each)	10	
a)	Design TM for recognizing $L = \{\text{num of } a > \text{num of } b\}$.		CO5 Ap
b)	Find Regular expression for the following DfA using Ardens Theorem. 		CO2 Ap
c)	State and prove closure property of context free language.		CO3 U

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Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Explain the working of the Turing machine. Design Turing machine for the language $L = \{0^n 1^n 2^n / n \geq 1\}$.		CO5	Ap
b)	Convert the following grammar into CNF: S → aB/bA A → a/aS/bAA B → b/bSA/aBBA		CO3	Ap
c)	Design DFA to check whether the given ternary number is divisible by 5.		CO1	Ap
Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	Give and explain formal definition of Pumping Lemma for Regular Language and prove that following language is not regular. $L = \{a^n b^n / n \geq 1\}$.		CO2	Ap
b)	Consider the DFA for the following over input {a,b}: a) Starts and ends with the same symbols. (4 M) b) Starts and ends with different symbols. (3 M) c) Must not contain substring aaa. (3 M)		CO1	Ap
c)	Design Turing machine for accepting even palindromes over {0,1}.		CO5	Ap
