Reg. No.:

Name :

VIT

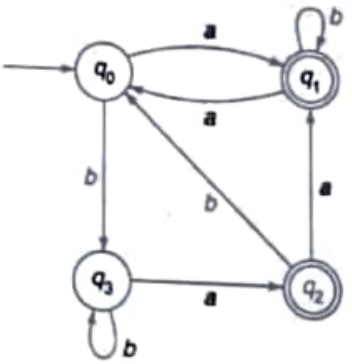
Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test- II (CAT-2)– October 2022

Programme	: **B.Tech. [CSE and Specialization]**	Semester	: **FS 22-23**
Course Code	: **BCSE304L**	Slot	: **B2+TB2**
Course Title	: **Theory of Computation**		
Faculty(s)	: **Dr Prakash P, Dr Smrithy G S, Dr Sivakumar, Dr Ashoka Rajan R, Dr. B V A N S S Prabhakar Rao, Dr Sureshkumar, Dr Maria Anu**	Class Nbr(s)	: **CH2022231001522, CH2022231001523, CH2022231001524, CH2022231001525, CH2022231001528, CH2022231001530, CH2022231001532**
Time	: **90 Minutes**	Max. Marks	: 50

Answer ALL the Questions

Q.No.	Sub. Sec.	Questions	Marks
1.	a.	Given the following Deterministic Finite Automaton, construct the equivalent regular expression using Arden's Method. (7 Marks) 	7
	b.	For each of the following languages, give two strings that are members and two strings that are not members—a total of four strings for each part. Assume the alphabet Σ = {a,b} in all parts. (3 Marks) (i) $\Sigma^* a \Sigma^* b \Sigma^* a \Sigma^*$ (ii) $(a \cup ba \cup bb)\Sigma^*$ (iii) $(\varepsilon \cup a)b$	3

2.	a.	Let $\Sigma = \{1, \#\}$ and let $Y = \{w \mid w = x_1\#x_2\#\cdots\#x_k$ for $k \geq 0$, each $x_i \in 1^*$, and $x_i \neq x_j$ for $i \neq j\}$. Prove that Y is not regular.	5
	b.	Let Σ be an alphabet. Define l_Σ to be the collection of all infinite languages over Σ. Note that l_Σ does not include any finite language over Σ. Prove that l_Σ is closed under union.	5
3.		Consider the language $L = \{a^i b^j c^k \mid i = j$ or $j = k$ where $i, j, k \geq 0\}$. i. Give a CFG that generates the language L. (7 Marks) ii. Is your grammar ambiguous? Justify your answer (3 Marks)	10
4.		Consider the following Grammar: $S \rightarrow abAB$ $A \rightarrow bAB \mid \varepsilon$ $B \rightarrow BAa \mid A \mid \varepsilon$ Convert the above grammar into Chomsky Normal Form. Illustrate the procedure step by step.	10
5.		Design a Push Down Automaton for the language: $L = \{a^{2n} b^{3n} \mid n \geq 0\}$.	10