

**VIT**Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)**School of Computer Science and Engineering****Fall Semester 2024-25****CAT I****SLOT: G1+TG1****Programme Name & Branch:** B.Tech CSE (Specialization in BBS)**Course Name & Code:** Formal Languages and Automata Theory – CBS2002**Class Number:** VL2024250104089**Faculty:** Prof. Lakshmanan K**Time:** 90 minutes**Max Marks:** 50**Instruction:** Write legibly and draw diagrams neatly. Write down the final answer after the process**Answer all Questions**

Q. No.	Question	Max Marks	CO	BL
1.	(a) Draw the Chomsky hierarchy diagram comprising the family of languages and their computational models. (4 Marks) (b) $L_1 = \{w \in \{0,1\}^* : w _0 = w _1\}$ and $L_2 = \{0^i 1^j \mid i, j \geq 0, i \geq j\}$. What is $L_1 \cap L_2$? (2 marks) (c) Differentiate NFA and DFA in terms of (the definition of) transition function and language acceptance. (4 marks)	10	CO1	BL2
2.	(a) Construct a DFA that accepts all strings over $\{a, b\}$ except those ending with aba. (4 Marks) [Hint: Recall the DFA for ending with aba and then see how can you take it from there] (b) Complete the missing transitions of the following DFA that accepts the language L_2 and is given by $L_2 = \{w \in \{a,b\}^* : w _a \bmod 3 = w _b \bmod 3\}$ (6 marks) Also identify the final state(s) of the automata to accept L_2 .	10	CO2	BL3
3.	(a) Construct the NFA for the regular expression $(0+1)^* 0(1^*)$ using Thomson's construction method. (4 marks)	10	CO2	BL3

	(b) Minimize the following DFA where q2, q5 q6 are the final states of the DFA. (6 marks)			
4.	Convert the following NFA with ϵ transition to an equivalent DFA	10	CO3	BL4
5.	(a) Convert the following DFA into an equivalent regular expression using Arden's method (7 marks) (b) Give a regular grammar for the language $L_5 = \{a^n b^{2m} \mid n, m \geq 0\}$ (3 marks)	10	CO3	BL4