Code: 20BS1403

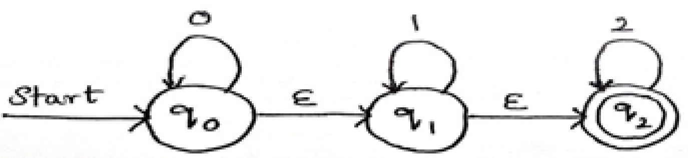
II B.Tech - II Semester – Regular / Supplementary Examinations
MAY - 2023

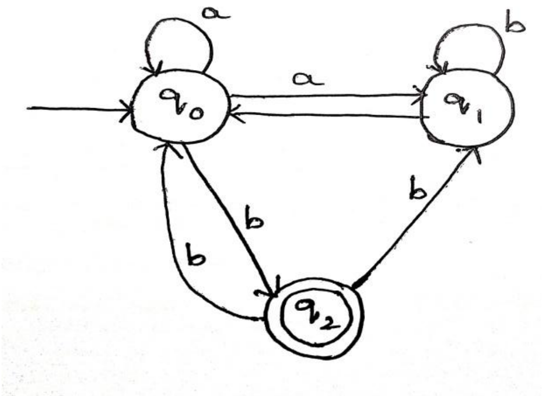
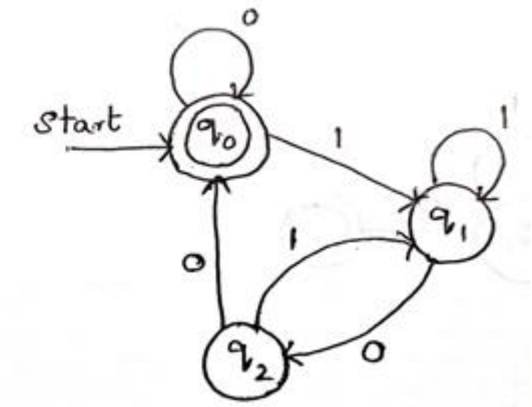
FORMAL LANGUAGES AND AUTOMATA THEORY
(COMPUTER SCIENCE & ENGINEERING)

Duration: 3 hours　　　　　　　　　　　Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level　　　　　　　　　　　CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Name the states and notations used for representing Finite Automata. Explain with an example.	L2	CO2	7 M
	b)	Show a Deterministic Finite Automata (DFA), M that accepts the language L(M)={w|w Ɛ {a,b}* and w does not contain 3 consecutive b's}.	L3	CO2	7 M
		OR			
2	a)	Infer an equivalent Non-Deterministic Finite Automata (NFA) without Ɛ – transition for NFA with Ɛ – transitions shown in below figure. 	L2	CO4	7 M

	b)	Construct a DFA equivalent to NFA. 	L3	CO4	7 M
		UNIT-II			
3	a)	Extract the regular expression from given DFA. 	L2	CO2	7 M
	b)	Using pumping lemma for regular sets, show that $L=\{0^n\}$where n is a perfect square, is not regular.	L3	CO2	7 M
		OR			
4	a)	Construct DFA equivalent to a regular expression $(0+1)^*(00+11)(0+1)^*$ and also find the reduced DFA.	L3	CO2	7 M
	b)	Sketch an Ɛ-NFA for the left linear grammar $S \rightarrow S10\|0$.	L3	CO2	7 M

UNIT-III					
5	a)	Convert the following grammar to Chomsky Normal Form (CNF) . $S \rightarrow aAbB$ $A \rightarrow aA \mid a$ $B \rightarrow bB \mid b$	L2	CO2	7 M
	b)	Consider the CFG with {S,A,B} as the non-terminal, alphabet, {a, b} as the terminal alphabet, S as the start symbol and the following set of production rules. $S \rightarrow ASA \mid aB \mid b$ $A \rightarrow B$ $B \rightarrow b \mid \varepsilon$ Construct a reduced grammar equivalent to the above grammar.	L3	CO2	7 M
OR					
6	a)	Consider the Grammar $S \rightarrow S+S \mid S*S \mid a \mid b$. Construct derivation tree for string w=a*b+a	L3	CO2	7 M
	b)	Eliminate all unit productions from the grammar $S \rightarrow AB$ $A \rightarrow a$ $B \rightarrow C \mid b$ $C \rightarrow D$ $D \rightarrow E \mid bC$ $E \rightarrow d \mid Ab$	L3	CO2	7 M

UNIT-IV					
7	a)	Devise a Push Down Automata (PDA), which accepts L= $\{a^n c^m b^n : m,n \geq 1\}$	L4	CO4	7 M
	b)	Discover a PDA to accept the language L=$\{W \mid W \in (a,b)^*$ and $n_a(W) > n_b(W)\}$	L3	CO2	7 M
OR					
8	a)	Give a deterministic PDA for the language L= $\{a^n c b^{2n} : n \geq 1\}$ over the alphabet $\Sigma = \{a,b,c\}$. Identify the acceptance state.	L2	CO2	7 M
	b)	For the grammar S→ aABC A → aB|a B → bA|b C→ a Articulate the corresponding PDA.	L3	CO2	7 M
UNIT-V					
9	a)	Define universal Turing machine and explain its functioning.	L2	CO3	7 M
	b)	Construct a Turing Machine that recognizes the set L=$\{0^{2n} 1^n \mid n \geq 0\}$.	L3	CO4	7 M
OR					
10	a)	Sketch the Turing Machine to recognize the palindromes of digits {0,1}. Give its state transition diagram also.	L3	CO3	7 M
	b)	What is posts correspondence problem? Explain with an example.	L2	CO4	7 M