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PES University, Bangalore

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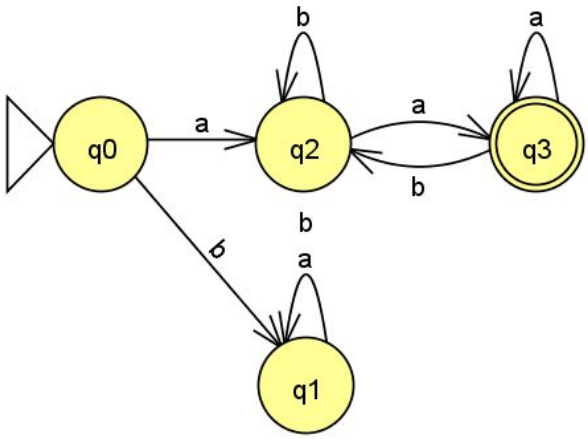
SAMPLE PAPER
FOR

IN SEMESTER ASSESSMENT (ISA-1)- B.TECH III SEMESTER
October, 2020

Automata Formal Languages & Logic

Time: 2 Hrs **Answer All Questions** **Max Marks: 60**

1	a	Suppose that you really, really dislike the string AFLL and want to build a language for everything except that string. Let Σ = {A, B, C, D ….. Z} and consider the language $L_{\sim AFLL}$ defined as follows: $L_{\sim aba} = \{ w \in \Sigma^* \mid w \neq AFLL \}$ For example, $\lambda \in L_{\sim AFLL}$, any other string like HELLO $\in L_{\sim AFLL}$, FLYR $\in L_{\sim AFLL}$ etc., but AFLL $\notin L_{\sim AFLL}$ Design a DFA for the language $L_{\sim AFLL}$	6
	b	Describe the language (i.e., set of all strings) accepted by the following automaton:  	4

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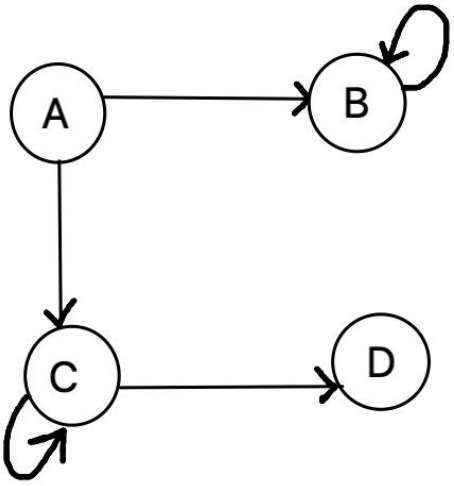
2	a	Let Σ = {1, 2, 3}. A path in a graph is a series of nodes $v_1, v_2, \ldots, v_n$ such that each pair of adjacent nodes in the path is connected by an edge.  We can represent a path in Graph as a nonempty string where the letters spell out the path in the graph. For example, the path A, C, C, D would be represented by the string ACCD. Let L = { w $\in$ Σ* | w represents a path in G }, where G is the graph given above. For example: A $\in$ L , B $\in$ L, C $\in$ L, D $\in$ L AB $\in$ L, ABB $\in$ L, ABBBBB $\in$ L, ABBBABBA $\in$ L etc BBBBB $\in$ L CCCC $\in$ L , CCD $\in$ L ACCD $\in$ L $\varepsilon \notin$ L BBAC $\notin$ L ABBC $\notin$ L, ADC $\notin$ L, DAC $\notin$ L Design a Finite Acceptor for the above Language L.	6

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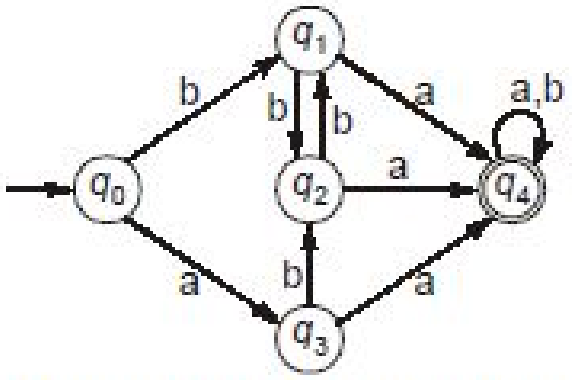
	b	Minimize the following DFA:  	4
3	a	Does the following language satisfy the pumping property? L = $\{0^{2n} \mid n \geq 1\}$ Also specify whether or not the above language is regular.	5
	b	Answer the following : 1. Are the following pairs of RegEx's equivalent? Justify $(0 + 1)^*(0 + \lambda)$ and $(1 + \lambda)(1 + 0)^*(0 + 1 + \lambda)$ 2. Describe the language of the following grammar as concisely as possible: $S \rightarrow aA \mid \lambda$ $A \rightarrow bS$	5 (2+3)
4	a	Construct a regular grammar to generate a number which can optionally have a decimal in which case the precision is exactly 2. (We assume by default that the number is positive) *valid strings :* 123.12 2 56754 92929292929292.12 0.21 *Invalid strings:* 12.1232 2.23332 e666.76 12. 12.2	5

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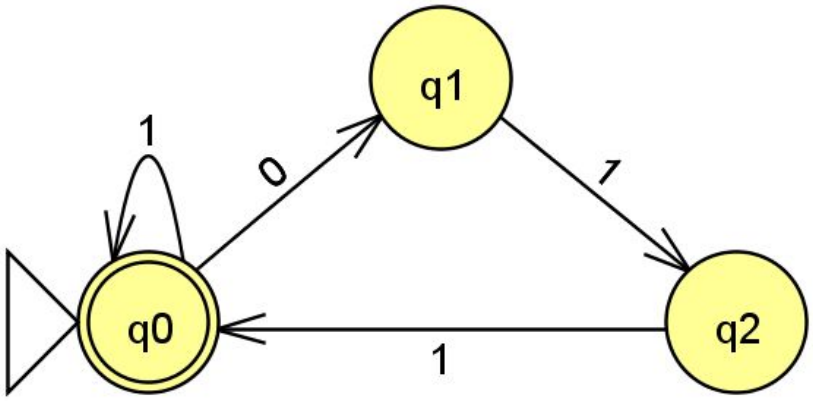
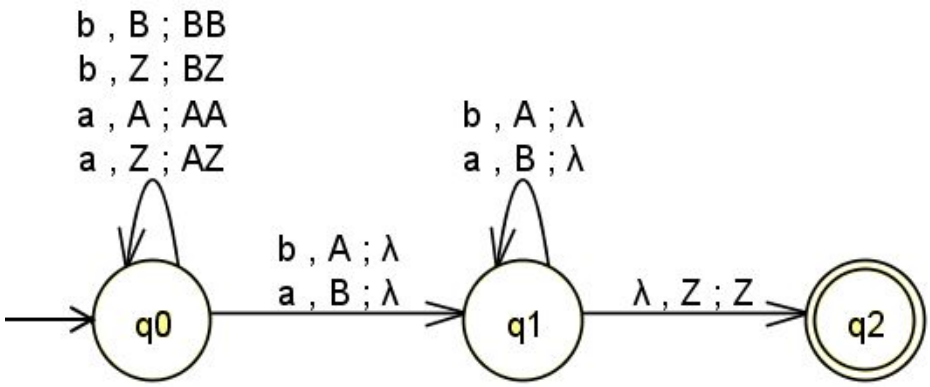
	b	Convert the following finite automata to regex: 	5
5	a	Is the following CFG ambiguous? If yes, show this. If no, explain why. A → aBbA | aBbAcA | d B → e A and B are nonterminals, A is the start symbol, a, b, c, d, and e are terminals.	5
	b	Show that L = {wx | w, x ∈ {a, b}* , |w| = |x|, and w != x}is a context free language.	5
6	a	Convert the following grammar to an equivalent one with no unit productions and no useless symbols. Show that the original grammar had NO useless symbols. What useless symbols are there after getting rid of unit productions? S → A | CB A → C | D B → 1B | 1 C → 0C | 0 D → 2D | 2	2
	b	What is the language of the given PDA ? 	4

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	c	Use CYK algorithm to fill the table using the following grammar S → AP | AB E → AP | EB | b P → EB A → a B → b	4

Φ				
		E,P		
Φ		E,P		
A	A			
a	a	b	b	b

Acknowledgement : The sample paper is prepared by Prof. Preet Kanwal.