Automata Theory Midterm Exam Solution 08 30 10 00 Am

Automata Theory Midterm Exam Solution 08 30 10 00 Am Automata Theory Midterm Exam Solution 08301000 AM This document provides a comprehensive solution to the Automata Theory midterm exam held on August 30th 2010 at 1000 AM It covers the essential concepts of finite automata regular expressions and contextfree grammars providing detailed explanations and solutions to the exam questions Note The actual exam questions might be different from those presented here This document aims to provide a general understanding of the concepts tested and how to approach similar questions Question 1 Finite Automata a Construct a DFA that accepts all strings over the alphabet a b that contain at least two consecutive bs Solution The DFA can be constructed as follows States q0 q1 q2 q3 Start state q0 Accepting state q3 Transitions q0 a q0 q0 b q1 q1 a q0 q1 b q2 q2 a q0 q2 b q3 q3 a q3 q3 b q3 Explanation 2 State q0 represents the initial state where no b has been encountered yet State q1 represents the state where one b has been encountered State q2 represents the state where two consecutive bs have been encountered State q3 is the accepting state and remains in this state upon encountering any further bs b Convert the DFA in part a to a regular expression Solution The regular expression can be obtained using the state elimination method 1 Eliminate q1 Replace the transition from q0 to q1 with the expression b Replace the transition from q1 to q2 with the expression b Remove q1 and its transitions 2 Eliminate q2 Replace the transition from q0 to q2 with the expression bb Replace the transition from q2 to q3 with the expression b Remove q2 and its transitions 3 Final expression The remaining transitions are q0 a q0 q0 bb q3 q3 a q3 q3 b q3 This can be represented by the regular expression abbab Question 2 Regular Expressions a Give a regular expression that accepts all strings over the alphabet a b that contain an even number of as and an odd number of bs Solution The regular expression can be constructed as follows Even as babab Odd bs baab The complete expression is bababbaab 3 Explanation The first part babab ensures an even number of as by accepting any combination of bs followed by two as The second part baab ensures an odd number of bs by starting with a b and then accepting any combination of as followed by a b b Show that the language accepted by the regular expression ab is a subset of the language accepted by the regular expression ab Solution To prove this we need to show that any string accepted by ab is also accepted by ab ab This expression accepts strings consisting of any number of repetitions of the substring ab ab This expression accepts any string containing as andor bs Since any string composed solely of ab repetitions is also a combination of as and bs any string accepted by ab is also accepted by ab Therefore the language accepted by ab is a subset of the language accepted by ab Question 3 ContextFree Grammars a Construct a CFG that generates the language an bn cm n 1 m 0 Solution The CFG can be constructed as follows S aSc T T bTc Explanation S The start symbol representing the entire language T Represents the substring of bs and cs aSc Generates strings with an equal number of as and bs followed by any number of cs bTc Generates strings with any number of bs followed by any number of cs Represents the empty string allowing for zero cs in the language b Show that the language an bn cn n 1 is not contextfree 4 Solution We can use the Pumping Lemma for contextfree languages to prove this Pumping Lemma For any contextfree language L there exists a pumping length p such that for any string s in L with length greater than or equal to p s can be decomposed as s uvxyz where vwx p vx 1 For all i 0 uvixyiz is also in L Proof Lets assume the language an bn cn n 1 is contextfree Then there exists a pumping length p Choose a string s ap bp cp Since s 3p p s can be pumped according to the Pumping Lemma According to the lemma we can decompose s as s uvxyz where vwx p and vx 1 This means that either v or x must contain at least one a or b as they cannot contain only cs because vwx p and the first p symbols are all as and bs Now consider the string uv2xy2z If v contains an a then uv2xy2z will have more as than bs If v contains a b then uv2xy2z will have more bs than as In either case uv2xy2z will not be in the language an bn cn n 1 Therefore we have reached a contradiction proving that our initial assumption that an bn cn n 1 is contextfree is incorrect Hence the language is not contextfree Conclusion This document provided a detailed solution to a hypothetical Automata Theory midterm exam It demonstrated how to construct finite automata convert them to regular expressions and use regular expressions to represent languages Additionally it covered the construction of contextfree grammars and the use of the Pumping Lemma to prove that certain languages are not contextfree Note This document is meant as a guide and should not be used as a substitute for proper learning and understanding of Automata Theory It is recommended to study relevant textbooks and practice solving various problems to gain a comprehensive understanding of the subject 5 solution i am a three digit number my second digit is 4 times solution find all real solutions of the equation enter your answers solution elimination 5x y 9 10x 7y 18 algebra homework helpsolution expand x h 3 algebra homework helpsolution a hospital staff mixed a 75 disinfectant solution with a solution solve 5x 6 20 algebra homework helpsolution perform operation simplify x 3 3 algebra homework helpsolution solve the system by graphing if there is no solution enter solution a quadratic equation always has two solutions how do you solution it takes jo 3 hours to paint the house and sam takes 5 www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com www.bing.com

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question 519758 a hospital staff mixed a 75 disinfectant solution with a 25 disinfectant solution how many liters of each were used to make 10 l of a 40 disinfectant solution

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