Midterm Coursework Assignment [001]

Total points 50

Instructions

1. Without using the truth table show the following statements are true. Explain your reasoning. **9 points**

a) $(p \to q) \vee (p \to r) \equiv \neg r \to (\neg p \vee q)$ [3 marks]

b) $(p \to \neg q) \wedge \neg p \equiv p \to (\neg q \wedge \neg p)$[3 marks]

c) $\neg p \to (q \to r) \equiv q \to (p \vee r)$ [3 marks]

Upload File

2. Prove the following statement by induction. For all nonnegative integers n, 6 divides $n^3 + 5n + 6$. State the mathematical induction and show your work clearly. [9 marks] **9 points**

Upload File

3. Students are required to create **6-character** long passwords to access the library. The letters must be from lowercase letters or digits. Each password must contain **at most three** lowercase-letters and contains **no repeated digits.** How many valid passwords are there? You are required to show your work step-by-step. [9 marks] **9 points**

Note:1hfg21is invalid because 1 appears more than once. 134ggg is valid because there are 3 lower-case letters, and no digits is repeated.

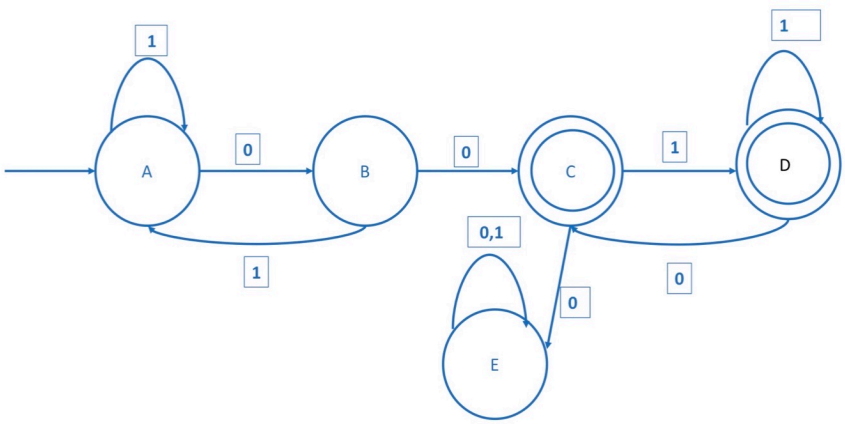
4. Consider the following automaton. **11 points**

a) Give an example of a string containing 11 that is **accepted** by the following automaton. [2 marks]

b) Give an example of a string of length 8 that is **rejected** by the following automaton. [2 marks]

c) Describe the language of this automaton in plain English. [4 marks]

d) Describe the language of this automaton using Regular expression. [3 marks]



Upload File

5. Given R = $1^*(0^*10^+)^+1^*$ and S = $0^*(1^*01^+)^*0^*$ **12 points**

a) Give an example of a string that is neither in the language of R nor in S. [2marks]

b) Give an example of a string that is in the language of S but not R. [2 marks]

c) Give an example of a string that is in the language of R but not S. [2 marks]

d) Give an example of a string that is in the language of *R* and *S*. [2 marks]

e) Design a regular expression that accepts the language of all binary strings with no occurrences of aab [4 marks]

Upload File

Last saved on Dec 13, 2:14 PM GMT

Submit Save draft

Like Dislike Report an issue