Final Exam

Due Jul 31 at 5pm **Points** 42 **Questions** 22
Available Jul 31 at 1pm - Jul 31 at 5pm about 4 hours **Time Limit** 75 Minutes

Instructions

Good luck!

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	75 minutes	10 out of 42 *

* Some questions not yet graded

Correct answers are hidden.

Score for this quiz: **10** out of 42 *
Submitted Jul 31 at 4:07pm
This attempt took 75 minutes.

Question 1 — 1 / 1 pts

There exists a nonregular language L such that L^* is regular.

- (●) True

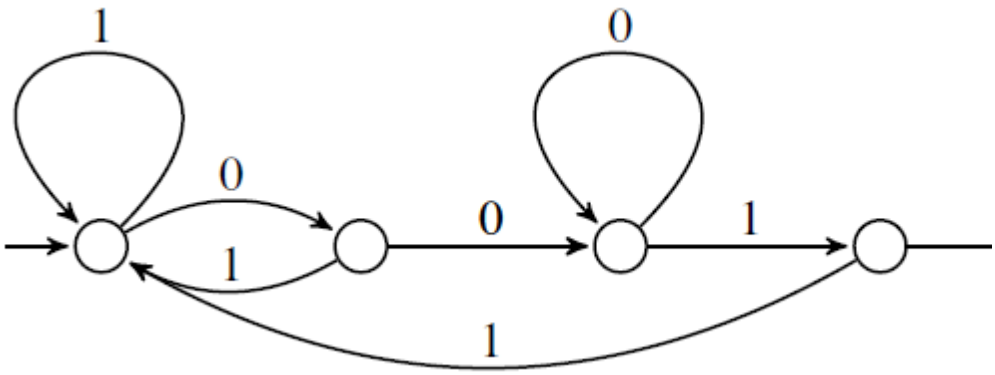
  Correct! The nonregular language L = $\{a^n b^n\}$ over {a,b} is not regular, but L* = {a, b}* is regular.

- ( ) False

Question 2

1 / 1 pts

Which simple description correctly describes the language recognized by the following DFA?



- None of the options.
- Only strings that contain 0110110 but not 0010
- All binary strings of length 12 that contains the substring 1111
- All binary strings that contain 0010 but not 00010
- All binary strings that contain 0010

Incorrect

Question 3

0 / 1 pts

Find the regular expression of the language of all strings of at least length 2 that do not end with *bc* over {b,c}.

- (b + c)*(bb + cc + cb)
- None of the options.

- All of the options.
- (b + c)*(bb + cc + cb)*
- (b + c)*(b + c)+
- (b + c)*

Question 4

1 / 1 pts

$\{wcw^Rcw \mid w \in \{a,b\}^*\}$ $(\subseteq \{a,b,c\}^*)$ can be represented as the intersection of two context free languages.

- True

Solution: It can be represented as the intersection of the following two context-free languages—

$$L_1 = \{\omega cxc\omega | \omega, x \in \{a,b\}^*\}$$
$$L_2 = \{\omega c\omega^R cx | \omega, x \in \{a,b\}^*\}$$

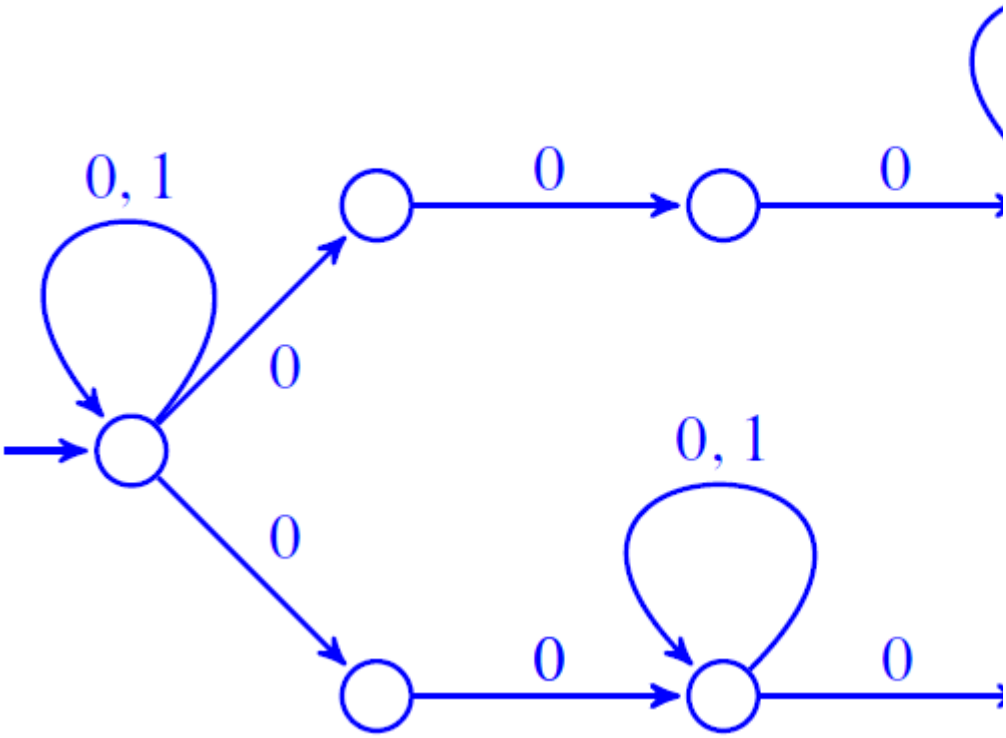
- False

Incorrect

Question 5

0 / 1 pts

Which description best fits the depicted machine:



Binary strings in which the number of 0s and the number of 1s is both even.

Binary strings in which there is a pair of 0s separated by a number of positions that is a multiple of 4.

Binary strings in which the 1000th symbol from the end is a 1.

Binary strings in which 000 occurs at least once or 00 occurs at least twice.

Binary strings where the final symbol has appeared before.

The complement of the language containing at most one occurrence of the substring 00.

All binary strings with the property that in every prefix, the number of 0s and the number of 1s differ by at most 2.

An NFA that accepts the language defined by: (0 U 1)*01(011 U 0*)11*.

Incorrect

Question 6

0 / 1 pts

The intersection of two non-context-free languages cannot be context-free.

- True

Incorrect.

- False

Question 7

1 / 1 pts

If L5/L3 is context free, and L5 is context free, then L3 **must** be regular.

- True
- False

Correct!

Incorrect

Question 8

0 / 1 pts

True or False?

$$\frac{\{a^m b^n | m,n \geq 1\}}{\{b^n | n \geq 1\}} = \{a^m \mid m \geq 1\}$$

- (•) True

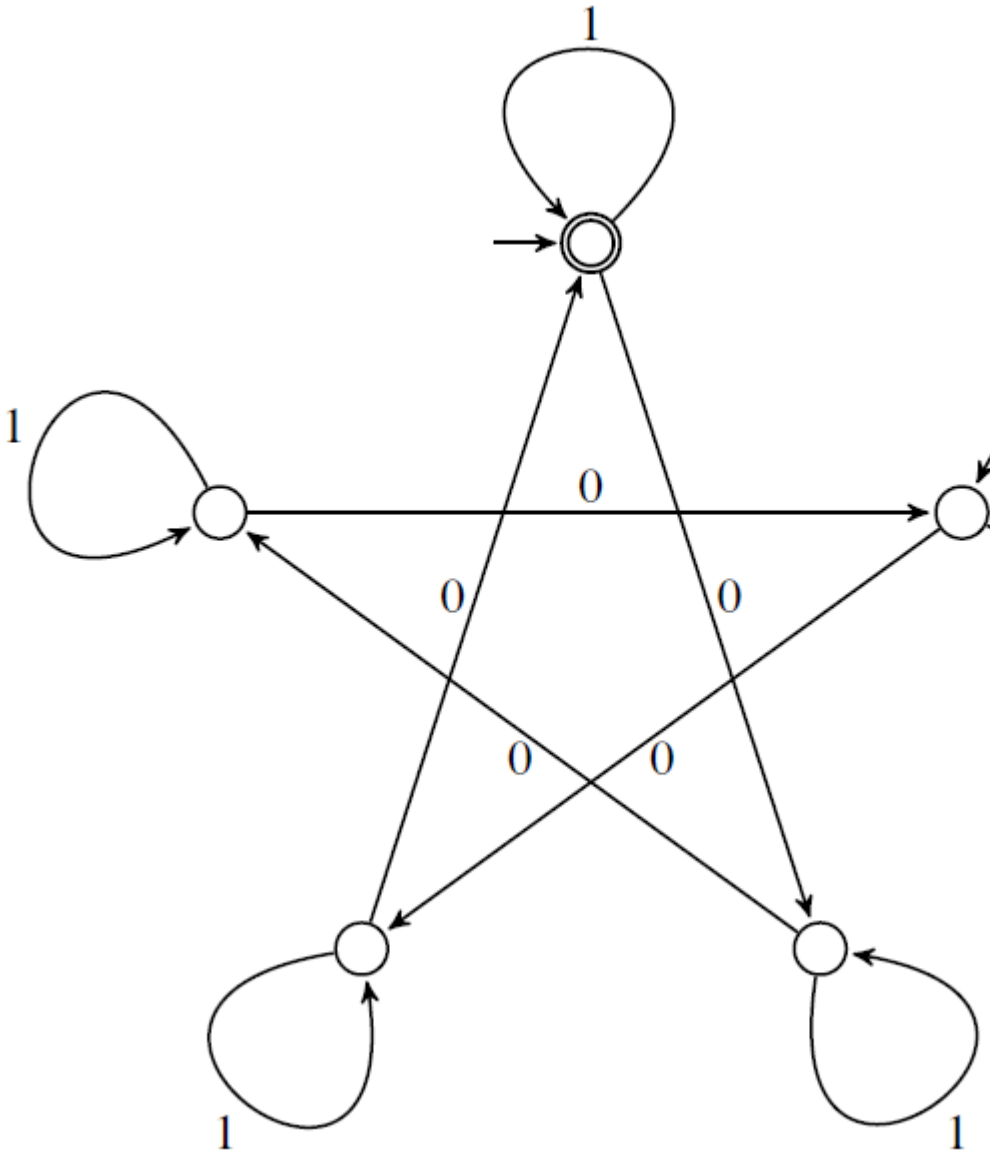
  Incorrect.

- ( ) False

Question 9

1 / 1 pts

Which strings are **not accepted** by the following DFA?



- 0101010101
- None are accepted.
- 10001110010100011101110100101001101101010 11
- 11100011100001111000
- 11100011100001111000 10101

Correct. The DFA accepts binary strings where the number of 0s is a multiple of 5. This string does not conform to those constraints.

- All are accepted.
- 0011101011011111

Incorrect

Question 10

0 / 1 pts

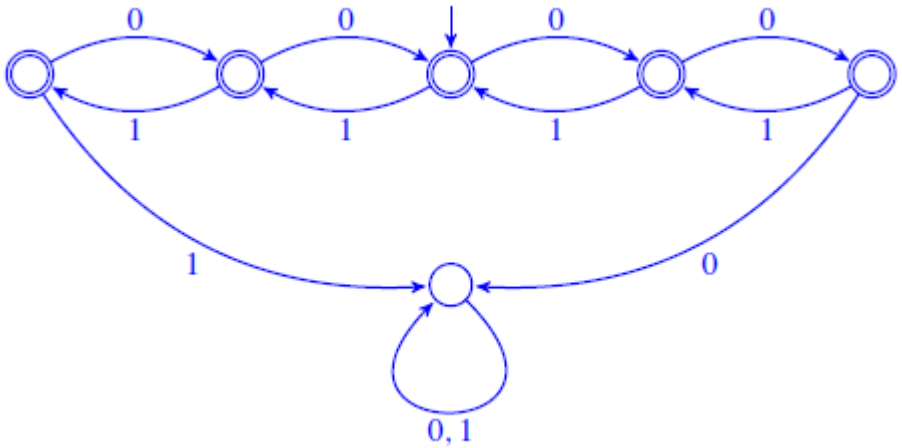
Find the regular expression for the language which contains strings containing both *aba* and *bab* as substrings over {a,b}.

- (a+b)*((aba (a+b)* bab))+ (a+b)*
- (a+b)* ((aba (a+b)* bab) + (bab (a+b)* aba))+ (a+b)*
- (a+b)* ((aba (a+b)* bab) + (bab (a+b)* aba) + abab + baba)+ (a+b)*
- All of the options.
- (a+b)*(aba)*(bab)*(a+b)*
- None of the options.

Question 11

1 / 1 pts

Which description best fits the depicted machine:



Binary strings in which the number of 0s and the number of 1s is both even.

Binary strings in which the 1000th symbol from the end is a 1.

None of the options.

The complement of the language containing at most one occurrence of the substring 00.

Binary strings where the final symbol has appeared before.

All binary strings with the property that in every prefix, the number of 0s and the number of 1s differ by at most 2.

An NFA that accepts the language defined by: (0 U 1)*01(011 U 0*)11*.

Binary strings in which there is a pair of 0s separated by a number of positions that is a multiple of 4.

Question 12

1 / 1 pts

Every non-regular language is infinite.

- (●) True

  True, because for every finite language, we can construct a finite state automaton to accept it.

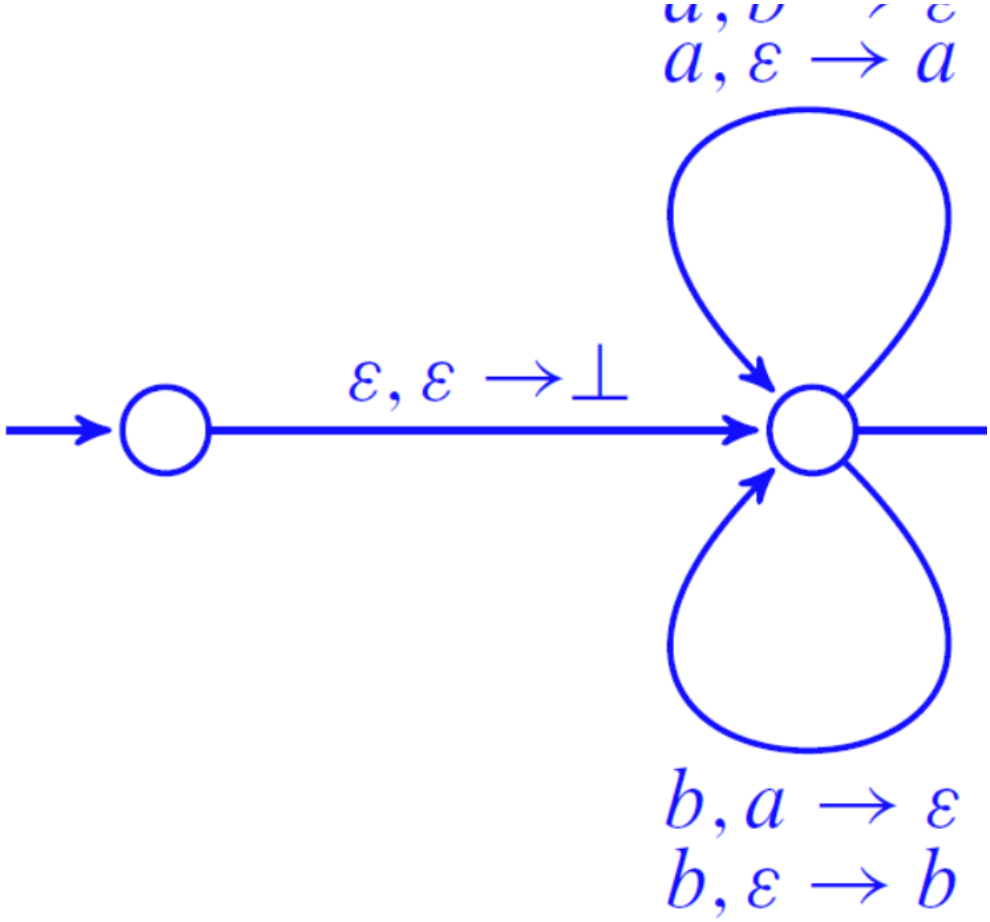
- ( ) False

Question 13

3 / 3 pts

Determine the language accepted by the PDA depicted below:

$a, b \rightarrow \varepsilon$



- All of the options.
- Strings in {a,b}* that contain less a's than b's
- Strings in {a,b}* that contain more a's than b's
- Strings in {a,b}* that contain twice as many a's as b's
- None of the options.
- Strings in {a,b}* that contain as many a's as b's

Question 14

Not yet graded / 3 pts

Is it possible that *P* = *NP* is undecidable?

Your Answer:

For statements P=NP of this type there are three possibilities.

If P = NP, it is decidable. it is possible to find a solution in polynomial time using an algorithm

If an algorithm exists, hence prove P = NP.

If P != NP, then this could be undecidable or decidable. We could find a proof that P != NP, in which case it is decidable or it is a trivial case were we cannot find a solution since it is based on 2 variables.

Thank you for your response.

Question 15

Not yet graded / 3 pts

Determine if the problem below is decidable and prove your answer:

On an input a Turing Machine, M, and a nonhalting state of M, q, determine whether M ever enters q when started on a blank tape.

Your Answer:

lets construct an instance (M1, q)

M1 has all the states of M and an additional state q

so M1 will accepts the same steps that are accepted by M but instead goes to state q instead of the final state.

therefore we can say M accepts lamba only if M' enters state q.

therefore this problem is undecidable

Thank you for your response.

Question 16

Not yet graded / 3 pts

Let L be a regular language over a language $\sum$. Define L' to be the set of all strings whose lengths is **not** a multiple of 2020. Prove that L' is regular.

Your Answer:

If there exists a DFA for L' then it is regular

L' is regular as the DFA accepts test strings any length which is not a multiple of 2020, so any test strings with length 0 1,2,... 2019 will be acceptable by the DFA.

as soon as a test string of length 2020 or a multiple of 2020 is reached, it reverts back to initial state and does not accept the string.

Therefore we can say that the language is regular.

Thank you for your response.

Question 17

Not yet graded / 3 pts

Let L be the language of strings over {a,b,c} in which the number of a's, b's, and c's are either all even, or precisely one of them is even. Give a DFA for l with at most 4 states.

Be sure to provide the proper notation for the machine definition, its transition functions, and states. Please also describe its operation in your own words.

Your Answer:

initial state q0 accepts any value a b or c and moves to state q1

from q1 it accept either a, b or c to reach final state

at this state the test string is always even

q0(a,b,c --> q1)

q2(a,b,c --> q3)

q3(a,b,c --> q4)

final state q4

Thank you for your response.

Incorrect

Question 18

0 / 3 pts

Which of the options describes the context-free grammar
$S \longrightarrow SSS|aS|Sb|\varepsilon$

- $(ba)^+(ab)^*$
- {a,b}*
- None of the options.
- $(a \cup b)^+$
- All of the options.
- a^*b^+

Incorrect, sorry.

Question 19

Not yet graded / 3 pts

Consider the following context-free grammar:

$$A \longrightarrow AA \mid B,\ B \longrightarrow A|cB|Bd|cBd|cd|c$$

Prove the grammar is ambiguous.

Your Answer:

this grammer has two parameters A and B and the solutions on this Grammar depends on the solutions that can be egenerated by the algorithm which accepts the condition that depends on A --> AA|B and B --> A

which is trivial hence this grammer is ambiguous

Thank you for your response.

Question 20

Not yet graded / 3 pts

Consider the language L whose strings are binary encodings (leading zeroes are ignored) of multiples of 17. L contains ε, 0, 00, 10001, 000010001, but not 10, 11, 0001. Prove that L is regular.

Your Answer:

A DFA can be constructed such that it has the following state and accepts the test string L

initial state q0

final state q5

q0(1,q1)

q1(0, q2)

Q2(0, q3)

q3(0,q4)

q4(1, q5)

an input of 1 for states q1 q2 q3 q4 and q5 will go to dead state

this DFA accepts 0, 00, 10001, 000010001 all the strings, all others will be rejected. hence this is a regular language

Thank you for your response.

Unanswered

Question 21

Not yet graded / 3 pts

Consider the following context-free grammar:

$$A \longrightarrow AA \mid B,\ B \longrightarrow A|cB|Bd|cBd|cd|c$$

Describe the language generated by this grammar.

Your Answer:

Incorrect

Question 22

0 / 3 pts

There exists a Turing Machine, N, that can detect when another Turing Machine, M, enters state *j* but only when they are run in parallel.

- (•) True
- ( ) False

Quiz Score: **10** out of 42