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| **Started on** | Wednesday, 15 March 2023, 12:52 PM |
| **State** | Finished |
| **Completed on** | Wednesday, 15 March 2023, 1:32 PM |
| **Time taken** | 39 mins 21 secs |
| **Grade** | **11.00** out of 20.00 (**55**%) |

Question **1**

Correct

Mark 1.00 out of 1.00

What is a regular language?

a. A formal language that can be defined by a regular expression

b. A formal language that can be recognized by a finite state machine

c. A formal language that can be generated by a regular grammar

d. All of the above ✓

Your answer is correct.

The correct answer is:
All of the above

Question **2**

Incorrect

Mark 0.00 out of 1.00

What is a context-free language?

a. A language that has no grammar rules

b. A language that can be spoken in any context ✗

c. A language requiring an unbounded memory to be recognized

d. A language for which you can apply Pumping Lemma

Your answer is incorrect.

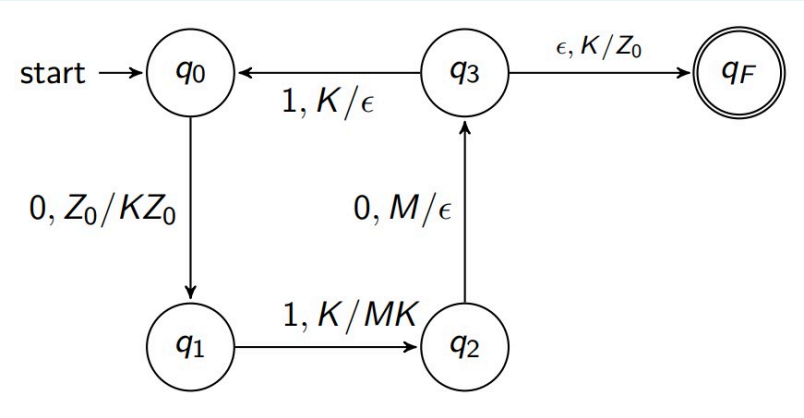
The correct answer is:
A language requiring an unbounded memory to be recognized

Question **3**

Correct

Mark 1.00 out of 1.00

Which of the following languages suits the drawn PDA?




a. L = {(01)$^n$0 | n>0 & n is odd} ✓

b. L = {(01)$^n$1 | n>0 & n is odd}

c. L = {(01)$^n$0 | n>0 & n is even}

d. L = {(01)$^n$1 | n>0 & n is even}

Your answer is correct.

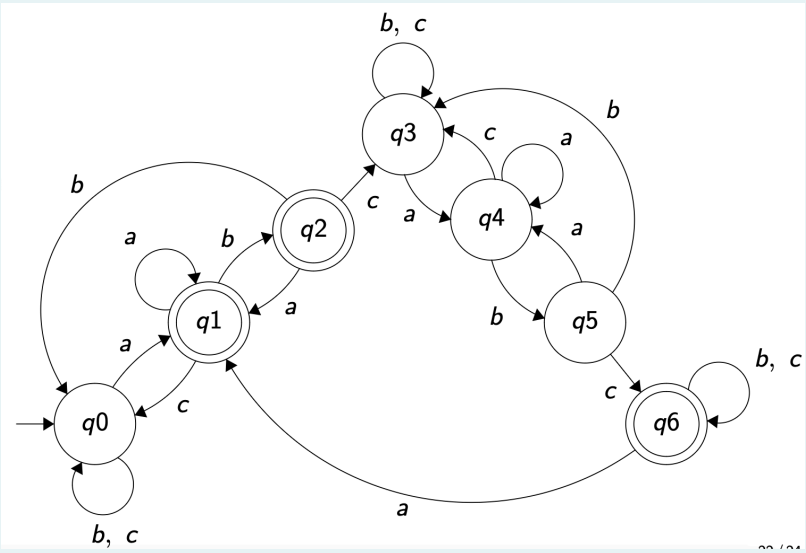
The correct answer is:
L = {(01)$^n$0 | n>0 & n is odd}

Question **4**

Correct

Mark 1.00 out of 1.00

Which of the following languages with Σ = {a, b, c} suits the drawn FSA?




a. L = {w ∈ Σ* | the substring abc in w occurs an odd number of times}

b. L = {w ∈ Σ* | the substring abc in w occurs an even number of times}

c. L = {w ∈ Σ* | the substring abc in w occurs an even number of times ∧ |w| > 0}

d. L = {w ∈ Σ* | the substring abc in w occurs an odd number of times ∧ |w| > 0}

e. None of the above ✓

Your answer is correct.

The correct answer is:
None of the above

Question **5**

Correct

Mark 1.00 out of 1.00

Relate the following statement: All sufficiently long words in a regular language can have a middle section of words repeated a number of times to produce a new word which also lies within the same language.

a. Halting Problem

b. Pumping Lemma ✓

c. Myhill–Nerode theorem

d. Rice Theorem

Your answer is correct.

The correct answer is:
Pumping Lemma

Question 6

Incorrect

Mark 0.00 out of 1.00

Which of the following languages is/are NOT regular?

- a. $a^nb^n$ ✓
- b. $L = \{wcw^R \mid w \in \{a, b\}* \wedge |w| > 0\}$ ✓
- c. $a^nb^m$ ✗
- d. $a^{n!}$ ✓

Your answer is incorrect.

The correct answers are:
$a^nb^n$,

$L = \{wcw^R \mid w \in \{a, b\}* \wedge |w| > 0\}$,

$a^{n!}$

Question 7

Correct

Mark 1.00 out of 1.00

Which of the following one can relate to the following statement: if n items are put in m containers with n>m, the at least one container will contain more than one item?

- a. Myhill–Nerode theorem
- b. Pigeonhole principle ✓
- c. None of the mentioned
- d. Pumping Lemma

Your answer is correct.

The correct answers are:
Pumping Lemma,

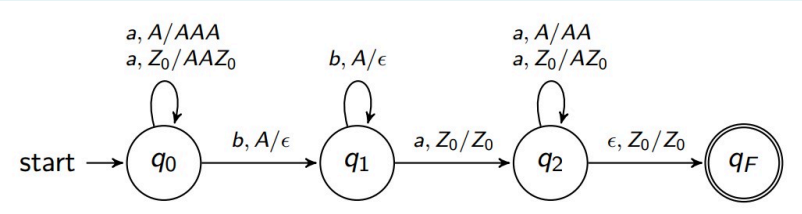
Pigeonhole principle

Question **8**

Incorrect

Mark 0.00 out of 1.00

Which of the following languages suits the drawn PDA?




a. L = {$a^n b^{2n} a$ | n ∈ **N**}

b. L = {$a^{2n} b^n a^n$ | n ∈ **N**}

c. L = {$a^n b^{2n} a^n$ | n ∈ **N**} ✕

d. L = {$a^{2n} b^n a$ | n ∈ **N**}

Your answer is incorrect.

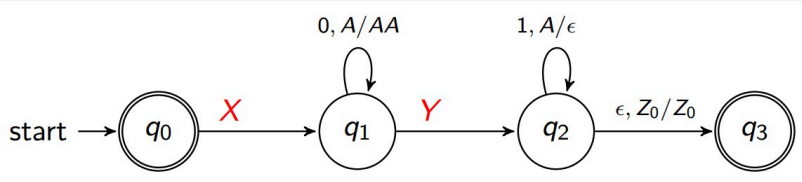
The correct answer is:
L = {$a^n b^{2n} a$ | n ∈ **N**}

Question **9**

Incorrect

Mark 0.00 out of 1.00

Find the rule transitions X and Y such that the following PDA recognizes the language L= {$0^n 1^{n+1}$ | n ∈ **N**}




a. X = “0, $Z_0/Z_0$”, Y = “1, A/ϵ”

b. X = “0, $Z_0/AZ_0$”, Y = “1, A/A”

c. X = “0, $Z_0/Z_0$”, Y = “1, A/A”

d. X = “0, $Z_0/AZ_0$”, Y = “1, A/ϵ” ✕

Your answer is incorrect.

The correct answer is:
X = “0, $Z_0/AZ_0$”, Y = “1, A/A”

Question **10**

Incorrect

Mark 0.00 out of 1.00

Which of the following statements about FSA is/are TRUE?

- a. Each complete FSA is also deterministic ✗
- b. The set of final states may be empty
- c. An FSA with a total transition function is called complete ✓
- d. The sets of initial and accepting states may not intersect
- e. In complete FSA the number of transitions from each state matches the number of symbols in the alphabet (assume no ε-moves) ✓

Your answer is incorrect.

The correct answers are:
An FSA with a total transition function is called complete,

In complete FSA the number of transitions from each state matches the number of symbols in the alphabet (assume no ε-moves)

Question **11**

Correct

Mark 1.00 out of 1.00

While applying Pumping lemma over a language, we consider a string w that belongs to L and fragment it into _____ parts.

- a. 9
- b. 7
- c. 5
- d. 3 ✓

Your answer is correct.

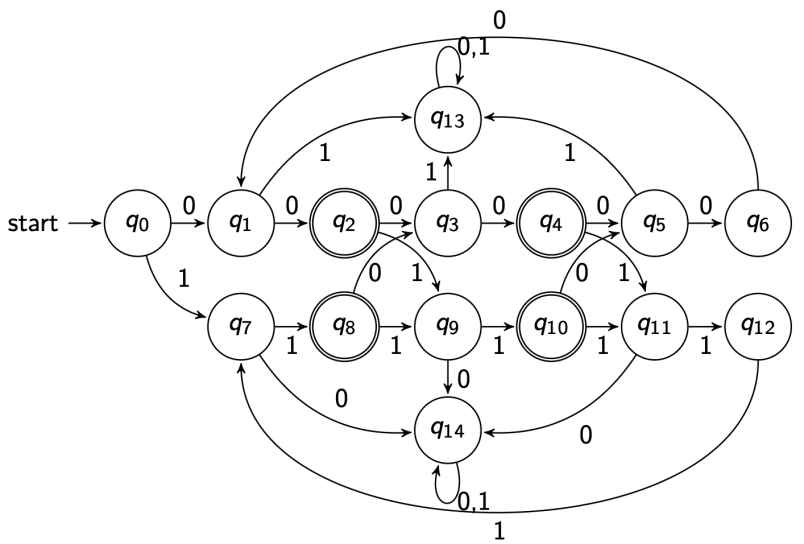
The correct answer is:
3

Question **12**

Incorrect

Mark 0.00 out of 1.00

Consider the given language L = {w ∈ Σ* | each 0 in w is doubled, each 1 is also doubled ∧ |w| is NOT divisible by 3} with Σ = {0, 1}. Given the incomplete FSA for this language type the missing transitions with its input and output state indices, e.g. for missing transition qy = (qx, 1) you should type x1y. If multiple transitions are missing, do NOT use spaces and use numerical order for both initial states (0-14) and transitions (0-1).




Answer: 619 ✗

The correct answer is: 6171201

Question **13**

Correct

Mark 1.00 out of 1.00

Languages are proved to be regular or non regular using Pumping Lemma

a. Often true ✓

b. False

c. True

d. Almost always false

Your answer is correct.

The correct answers are:
True,

False,

Often true,

Almost always false

Question **14**

Incorrect

Mark 0.00 out of 1.00

Which of the following statements about FST is/are TRUE?

- a. Also called finite-state deceptor
- b. The translation may happen only to the accepted strings ✓
- c. It is an FSA with input and output tapes ✓
- d. Input and output alphabets have to match ✗

Your answer is incorrect.

The correct answers are:
It is an FSA with input and output tapes,

The translation may happen only to the accepted strings

Question **15**

Correct

Mark 1.00 out of 1.00

Which of the following languages require(s) unbounded memory to be recognized?

- a. $L = \{ a^n b^n \}$ ✓
- b. $L = \{ a^n b^m \mid n \neq m \}$ ✗
- c. $L = \{ a^{n!} \}$ ✓
- d. $L = \{ wcw^R \mid w \in \{a, b\}* \wedge |w| > 0 \}$ ✓

Your answer is correct.

The correct answers are:
$L = \{ a^n b^n \}$,

$L = \{ wcw^R \mid w \in \{a, b\}* \wedge |w| > 0 \}$,

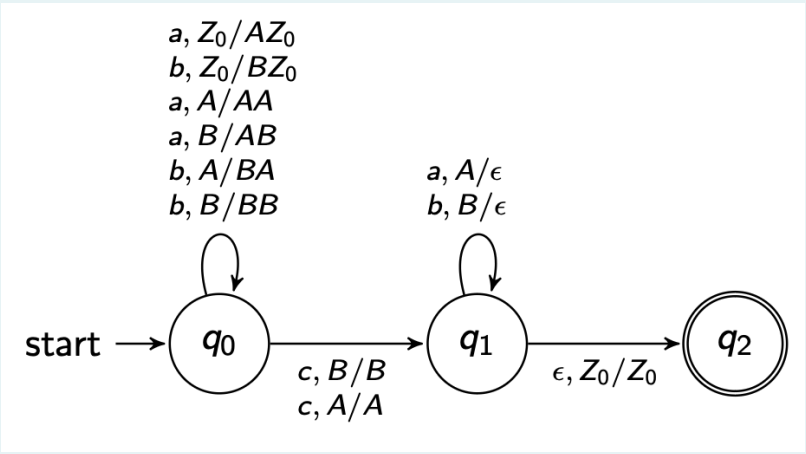
$L = \{ a^{n!} \}$

Question **16**

Correct

Mark 1.00 out of 1.00

Which of the following languages suits the drawn PDA?




a. $L = \{wcw^R \mid w \in \{a, b\}^* \ \& \ |w| \geq 0\}$

b. $L = \{wcw^R \mid w \in \{a, b\} \ \& \ |w| > 0\}$

c. $L = \{wcw^R \mid w \in \{a, b\}* \ \& \ |w| > 0\}$ ✓

d. $L = \{wcw^R \mid w \in \{a, b\}* \ \& \ |w| = 0\}$

Your answer is correct.

The correct answer is: $L = \{wcw^R \mid w \in \{a, b\}* \ \& \ |w| > 0\}$

Question **17**

Incorrect

Mark 0.00 out of 1.00

Pumping lemma for context free grammar is used for:

a. Proving certain languages are not context free

b. Proving language is infinite

c. Proving certain languages are not context free and that language is infinite

d. None of the above ✗

Your answer is incorrect.

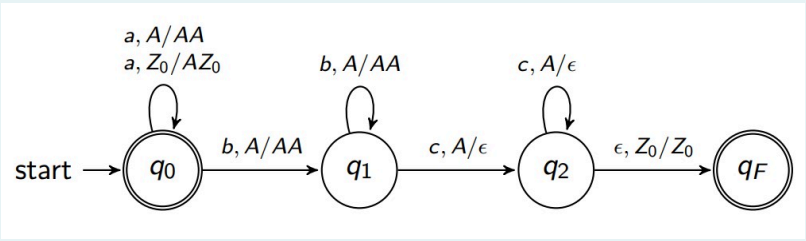
The correct answer is:
Proving certain languages are not context free

Question **18**

Correct

Mark 1.00 out of 1.00

The following PDA recognizes L={$a^i b^j c^k$ | RULL}. Find “RULL”.




- a. RULL = “ i + k = j ”
- b. RULL = “ k + j = i ”
- c. RULL = “ i + i = k ”
- d. RULL = “ j + i = k ” ✓

Your answer is correct.

The correct answer is:
RULL = “ j + i = k ”

Question **19**

Incorrect

Mark 0.00 out of 1.00

What is the Kleene star operation on a formal language?

- a. The operation that returns the set of all strings that can be obtained by inserting any symbol from the alphabet between any two symbols of any string from the language ✗
- b. The operation that returns the set of all strings that can be obtained by repeating any string from the language any number of times, including zero times ✗
- c. The operation that returns the complement of a given language
- d. It is the free monoid on that language

Your answer is incorrect.

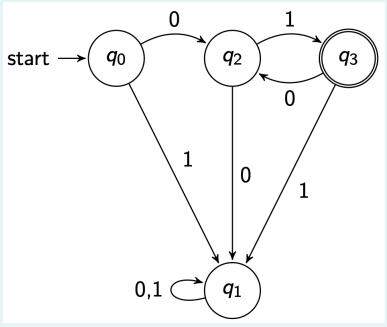
The correct answer is:
It is the free monoid on that language

Question **20**

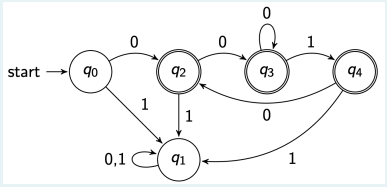
Correct

Mark 1.00 out of 1.00

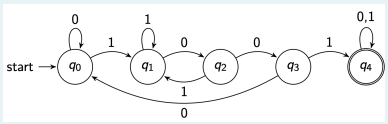
Match the FSAs with the languages that may be accepted by them (Σ = {0, 1})



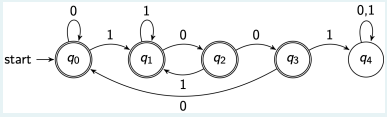

L = {w ∈ Σ∗ | w starts from 0 ∧ w ends with 1 ∧ w does NOT contain substrings containing the same symb




L = {w ∈ Σ∗ | in w each 1 is preceded by double 0 ∧ w starts from 0}



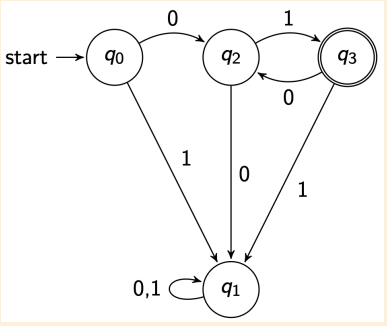

L = {w ∈ Σ∗ | w contains the substring 1001}



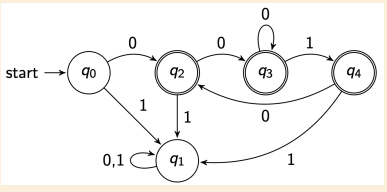

L = {w ∈ Σ∗ | w does NOT contain the substring 1001}

Your answer is correct.

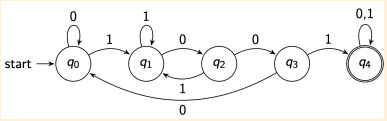
The correct answer is:



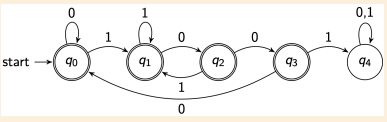

→ L = {w ∈ Σ∗ | w starts from 0 ∧ w ends with 1 ∧ w does NOT contain substrings containing the same symbol with the length 2 ∧ |w| > 1},




→ L = {w ∈ Σ∗ | in w each 1 is preceded by double 0 ∧ w starts from 0},




→ L = {w ∈ Σ∗ | w contains the substring 1001},




→ L = {w ∈ Σ∗ | w does NOT contain the substring 1001}