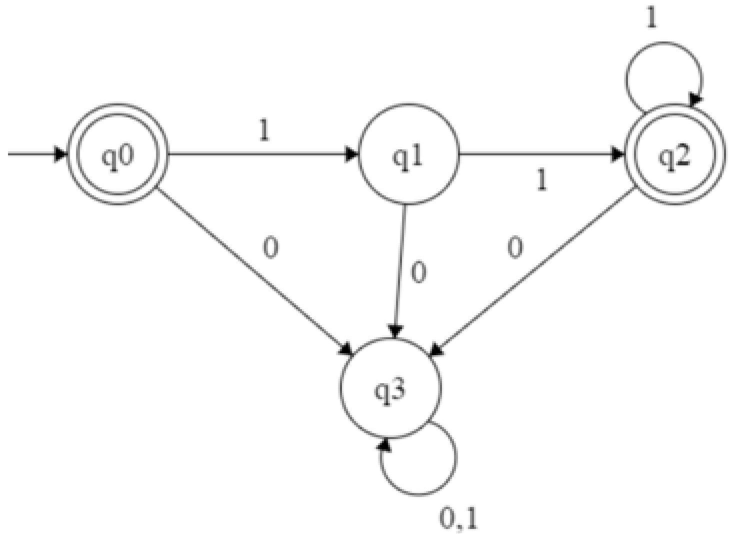
SORU-1

(X) Boş bırak

The finite automaton pictured in the figure below represents what language?



A-) Changes the sign bit

B-) Increments a given bit pattern by 1

C-) Complements a given bit pattern

D-) None of them

E-) Finds 2's complement of a given bit pattern

SORU-2

(X) Boş bırak

We know that we can find a Turing machine M that decides the language L.

Which one of the following is **FALSE**?

A-) None of them.

B-) M is a recognizer for L.

C-) M is a decider for L.

D-) M may loop forever for some strings not in L.

E-) M does not loop forever for all strings in L.

SORU-3

(X) Boş bırak

Fill in the blank with the correct option.

____________________________ Thus, there are languages that are not Turing recognizable.

A-) Turing recognizable languages does not include Turing enumerable languages.

B-) Set of all languages is uncountable, but the set of Turing recognizable languages is countable.

C-) Turing recognizable languages does not include regular languages.

D-) Set of all languages is not decidable, but the set of Turing recognizable language is decidable.

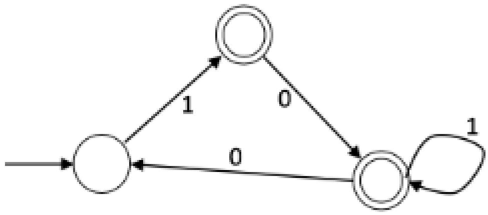
E-) All the options can be used to fill in the blank.

SORU-4

(X) Boş bırak

Let ε be empty string.

Which one of the following context-free grammars belongs to the automaton given below?



A-)

S → 1A

A → 0B

B → 1B | 0S

B-)

S → 1A

A → 0B |

B → 1B | 0S | ε

C-)

S → 1A

A → 0B | ε

B → 1B | 0S

D-) None of them.

E-)

S → 1A

A → 0B

B → 1B | 0S | ε

Definition: A Turing machine is a 7-tuple given by

$(Q, \Sigma, \Gamma, \delta, q_0, q_{accept}, q_{reject})$

where Q, Σ, Γ are all finite sets and

1. Q denotes the set of states,
2. Σ denotes the input alphabet not containing the blank symbol $,
3. Γ denotes the tape alphabet, where $\$ \in \Gamma$ and $\Sigma \subseteq \Gamma$,
4. $\delta: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R\}$ is the transition function, where L and R denote the moves to the left and right, respectively.
5. $q_0 \in Q$ is the start state,
6. $q_{accept} \in Q$ is the accept state, and
7. $q_{reject} \in Q$ is the reject state, where $q_{reject} \neq q_{accept}$.

Given the above definition of a standard Turing machine, which one of the following is TRUE?

A-) A standard Turing machine cannot write the blank symbol on its tape. ○

B-) In a standard Turing machine, the tape alphabet can be same as the input alphabet. ○

C-) A standard Turing machine can not contain just a single state. ○

D-) A standard Turing machine's head cannot be in the same location in successive steps. ○

SORU-6

(X) Boş bırak

Let the alphabet be $\Sigma=\{0,1\}$, and let ε be empty string.

Let A be the language of strings $w \in \Sigma^*$ containing exactly one double symbol. We say that a string has a double symbol if it contains 00 or 11 as a substring. The string 10010 has exactly one double symbol, but 100010 has two double symbols.

Which one of the following is the regular expression for the language A.

A-) $(\varepsilon+1)(01)^*00(10)^*(\varepsilon+1) + (\varepsilon+0)(10)^*11(01)^*(\varepsilon+0)$

B-) $(\varepsilon+1)(11)^*00(10)^*(\varepsilon+1) + (\varepsilon+0)(10)^*11(00)^*(\varepsilon+0)$

C-) $(\varepsilon+1)(00)^*00(10)^*(\varepsilon+1) + (\varepsilon+0)(10)^*11(11)^*(\varepsilon+0)$

D-) $(\varepsilon+1)(00)^*01(10)^*(\varepsilon+1) + (\varepsilon+0)(10)^*10(11)^*(\varepsilon+0)$

SORU-7

(X) Boş bırak

Which one of the following statements are **<u>TRUE</u>**?

I. Every multi-tape Turing machine has an equivalent single-tape Turing machine.

II. Every context-free language is Turing-recognizable.

III. Every language is Turing-recognizable.

A-) I, II and IIII

B-) II and III

C-) I and III

D-) I and II

E-) None of them.

SORU-8

(X) Boş bırak

Which one of the following are correct?

A-) The language $\{a^n b^n \mid 0 \leq n \leq 3\}$ is non-regular.

B-) The class of context-free languages is closed under intersection.

C-) If A and B are regular languages, then $(A \cup B)^*$ is regular.

D-) If A is a regular language, then A is finite.

E-) The language $\{a^n b^n a^n \mid 0 \leq n\}$ is regular.

SORU-9

(X) Boş bırak

Let w denote a string.

Which one of the following is **not** decidable?

A-) L ={ <M,w> | M is a non-deterministic finite automaton that accepts w}

B-) L={ <M,w> | M is a deterministic finite automaton that accepts w}

C-) L ={ <M,w> | M is a push down automaton that accepts w}

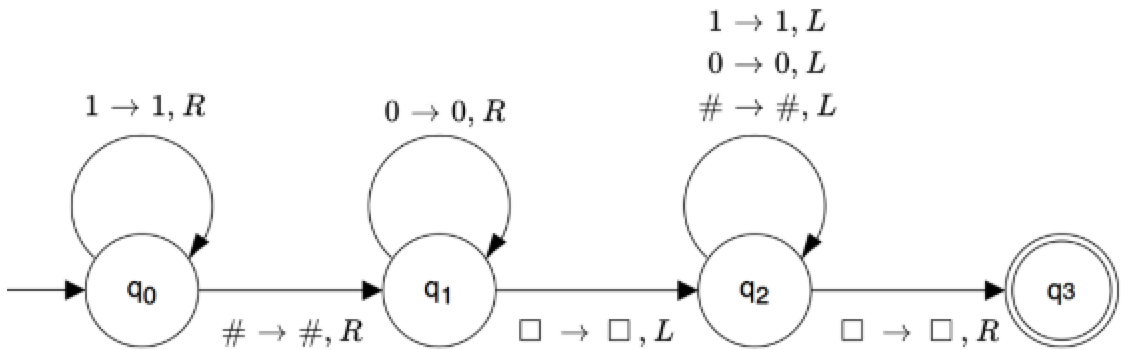
D-) None of them.

E-) L ={ <M,w> | M is a Turing machine that accepts w}

SORU-10

(X) Boş bırak

Consider following Turing machine, wherein □ denotes the blank symbol, and input tape is infinite in both ends. Which of the following is FALSE?



A-) One purpose of q_2 is to return to the starting position.

B-) One purpose of q_0 is to consume starting 1's.

C-) This Turing machine accepts the string 1#000

D-) This Turing machine accepts the string 10#00

E-) After the Turing machine accepts a string, the head goes to its starting position.

SORU-11

(X) Boş bırak

Let the alphabet be Σ={a,b,c}.

Which one of the following grammars is in Chomsky normal form?

A-)

$S \rightarrow TT \mid a$

$T \rightarrow c$

B-)

$S \rightarrow TT \mid ac$

$T \rightarrow c$

C-)

$S \rightarrow TTa \mid a$

$T \rightarrow c$

D-)

$S \rightarrow TTTa \mid a$

$T \rightarrow c$

E-)

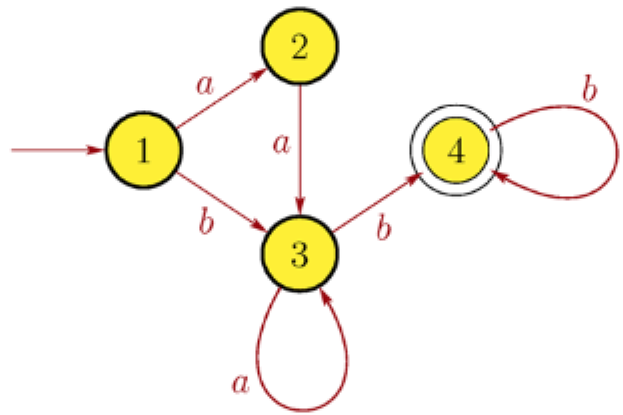
$S \rightarrow Ta \mid a$

$T \rightarrow c$

SORU-12

(X) Boş bırak

Let ε be empty string. Give a regular expression for the language recognized by the non-deterministic finite automata (NFA) given below.



A-) $(aaa^* + ba^*)a^*bb^*$

B-) $(aa + b)a^*bb^*$

C-) $(ba^* + \varepsilon)\ a^*bb^*$

D-) $(aa + \varepsilon)a^*bb^*$

E-) $(ba^* + a^*b)a^*bb^*$

SORU-13

(X) Boş bırak

Let $L = \{ w \in (0+1)^* \mid w$ has even number of 1's$\}$, i.e. L is the set of all bit strings with even number of 1's.

Which one of the regular expressions below represents L?

A-) $0^*1(10^*1)10^*$

B-) $(0^*10^*1)^*$

C-) $0^*(10^*1^*)^*0^*$

D-) $0^*(0^*10^*10^*)^*0^*$

E-) None of them

SORU-14

(X) Boş bırak

Let A be a language.

Which one of the following is **FALSE**.

A-) If A is finite, then A has to be Turing-recognizable.

B-) If A is regular, then A has to be Turing-recognizable.

C-) If A is context-free, then A has to be Turing-decidable.

D-) If A is infinite, then A has to be Turing-acceptable.

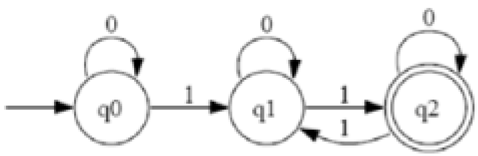
E-) If A is context-free, then A has to be Turing-recognizable.

Which one of the following deterministic finite automata (DFA) accepts the language

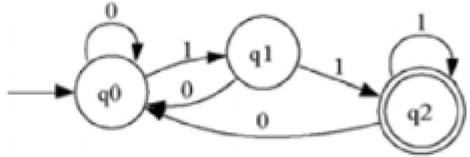
$$L=\{w \in \Sigma^* \mid \text{each 1 in } w \text{ is immediately followed by a } 0\}$$

over alphabet $\Sigma=\{0,1\}$.

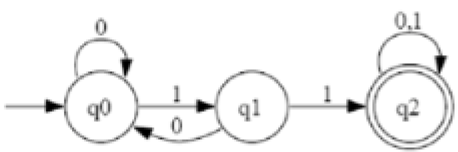
A-)



B-)

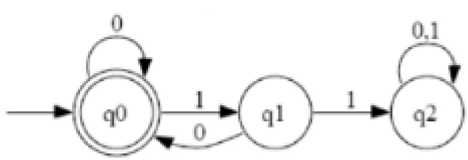


C-)



D-) None of them.

E-)



Which ones of the following statements are <u>TRUE</u>?

Statement I: If $A \subseteq B$ and A is a regular language, then B must be regular.

Statement II: If $A \subseteq B$ and B is a regular language, then A must be regular

A-) Both statements are ambiguous.

B-) Both statements are FALSE.

C-) Only second statement is TRUE.

D-) Only first statement is TRUE.

E-) Both statements are TRUE.

Which one of the following languages is context free?

A-) $L=\{a^m b^n (ac)^{m+n} \mid m,n \geq 1\}$ ○

B-) $L=\{a^{m+n} (ab)^m c^{m+n} \mid m,n \geq 1\}$ ○

C-) $L=\{(ac)^m c^m b^m \mid m,n \geq 1\}$ ◉

D-) $L=\{a^m (ac)^{m+n} b^m \mid m,n \geq 1\}$ ○

E-) $L=\{a^m b^m (ac)^{m+n} \mid m,n \geq 1\}$ ○

SORU-18

(X) Boş bırak

Let A={a,b,c} and B={1,2,3,4} be the domain and range of the function

f:A→B such that

f(a)=1,

f(b)=2,

f(c)=1.

Then, which one of the following is **FALSE** about the function f:A→B.

A-) There exist a standard Turing machine that implements the function f.

B-) It is not an invertible function since f(a)=f(c)=1.

C-) It is not a correspondence because f is not one-to-one and onto.

D-) It is not an onto function because nothing in A maps to 3 or to 4, which are both in B.

E-) It is a one-to-one function since f(a)=f(c)=1.

SORU-19

(X) Boş bırak

Consider the following languages.

$L_1=\{\ 0^p1^q0^r \mid p,\ q,\ r\geq 0\}$

$L_2=\{\ 0^p1^q0^r \mid p,\ q,\ r\geq 0 \text{ and } p\neq q\ \}$

Which one of the following statements is FALSE?

A-) L_2 is subset of L_1.

B-) Complement of L_1 is context-free but not regular.

C-) L_1 intersection L_2 is context-free.

D-) L_2 is context-free.

E-) L_1 is context-free.

SORU-20

(X) Boş bırak

Fill in the blank with the correct option.

$L=\{a^n b^n c^n \mid n \geq 0\}$ is not a context-free language because

_______________________________.

A-) L is not a regular language.

B-) $A=\{a^5 b^5 c^5\}$ is not a context-free language.

C-) L is not Turing recognizable.

D-) L is a context-free language. The question is wrong.

E-) we can use Pumping Lemma to prove that L is not a context-free.