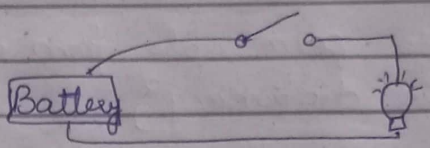
TOA

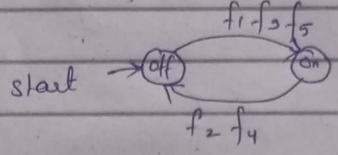
Decoder => select
Automata => automatic



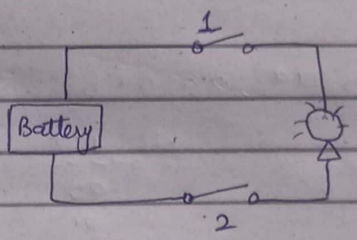
odd => on

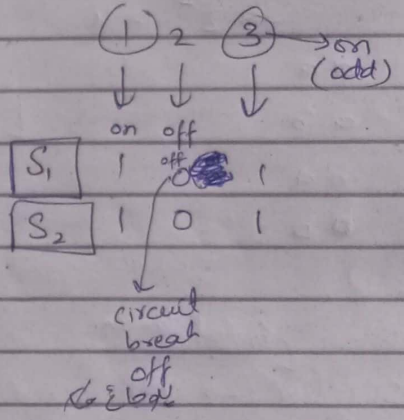
f => flip

jitna zadha data utni zadha accuracy



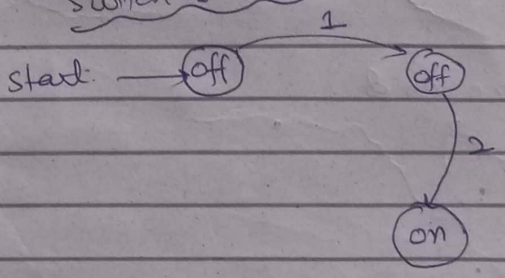
shru mai bulb off he hota
odd mai on hotee hai



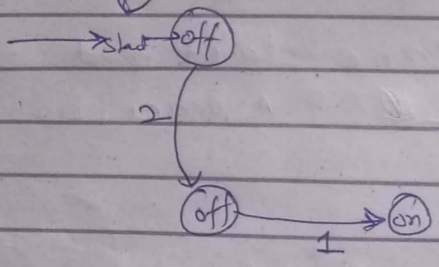


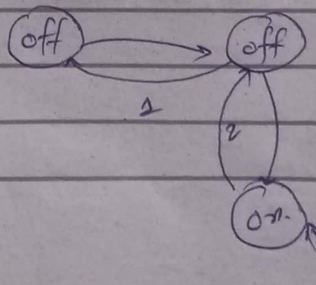
~~both~~ bulb will on only
when both were switched
on at odd

Switch 1 se start



Switch 2 se start





off

alphabets => finite (non-empty) sets of symbols.

language => sets of word

$\Sigma = \{a, b\}$

string => any combination of alphabets

word, → apple => string
→ pple => string

tokenization

word => if a string is permissible from a language {defined in dictionary}

Null String => $\in$ or $\wedge$ => length = 0

$\Sigma = \{a, b\}$

$\Rightarrow 2^2 = 4$

aa
ab
ba
bb

$L = \{\wedge, a, b, aa, ab, ba, bb, \ldots\}$

$2^{n+1} \leftarrow 2^1 2^0$
00
01
10
11

Description (English language) -> All words of a's and b's which starts and ends at different alphabets.

$L = \{a, b, ab, ba, \ldots\}$ aax => Reqd.

Same started and same end.

$L = \{\wedge, a, b, aa, bb, \ldots\}$

$\{a^n ; n = 1, 2, 3, \ldots\} \Rightarrow L = \{a, aa, aaa, \ldots\}$

$a^0 \Rightarrow \{\wedge\}$

TOA

Valid / Invalid alphabets

one letter should not be the prefix of another

alphabet کے اندر آیا ہوا ٹوٹ کے دوسرے کا prefix نہ ہو.

B → Ba (B is the prefix of Ba)

ba بن گیا.

Bab → length = 2

$\Sigma_1 = \{B, aB, bab, d\}$ => valid

$\Sigma_2 = \{B, Ba, bab, d\}$ => invalid (B, Ba → prefix)

Lexeme: (B) (aB) (bab) (Bd)

→ Tokens => B, aB, bab, B, d => length => 5

Lexeme k aik aik character korcad kunte. Agar string in Σ se banee toh tokenization lazmi.

Reverse of a String

=> Tokens reverse ہوں گے

BaBbabBd

→ (d)(B)(bab)(B)(aB)

d, B, bab, B, aB → Tokens => 5

(B), (aB), (bab), (B), (d)

Reverse → (d), (B), (bab), (aB), (B)

Defining Languages

Descriptive → English

odd length => odd string's length

$\Sigma\{a\}$ => odd

$L = \{a, aaa, aa \dots\}$

$\Sigma\{a\}$ => even

$L = \{aa, aaaa, \dots\}$

$L = \{a^0, a^2, a^4, \dots\}$

$\Sigma = \{0, 1, 2\}$ => $3^1 = 3$

=> $3^2 = 9$ → length 2 ke combinations.

base

E^L = no of string combination

Ealphales length =

$3^2 = 9$

00
01
02
10
11
12
20
21
22

$3^3 = 27$ → 3 depth copy karna hoga

① Equal

$\Sigma = \{a, b\}$ => alphabets

$L = \{\wedge, ab, aabb, abab \dots\}$

② Even length. { even no of a and b }

$\Sigma = \{a, b\}$

$= \{\wedge, aa, bb, aabb, aaaa, \dots\}$

③ Integer.

$\Sigma \{0, \pm 1 \dots\}$

$\Sigma\{a, b\}$ $\{a^n b^n a^n\}$ $n = 2$

↳ aabbaa

Palindrome

bab

ایسی language جو string بنتی ہے اس کو reverse کرنے original string اور reverse strg equal آجائیں۔ اس میں alphabets کا ~~string~~ set پتا ہوتا ہے

⊙ KLEEN's STAR ⟷ / KLEEN's CLOSURE (*)

→ this is operator — operation (+, −)

{they perform actions}

Σ^* (collection of all strings Σ, including null Λ)

Σ سے جتنی بھی strings بنتی ہیں وہ سب Σ* میں آجاتی۔

1. It accepts null
2. It generates all possible combinations.
3. It always generate set of infinite language

جس کا * لیتے اس کے infinite length / infinite language بنتی

→ yeh operator → language ko explain krne k liye

$\Sigma = \{x\}$

$\Rightarrow \Sigma^* = \{\Lambda, x, xx, xxx, \ldots\}$

(side note: Λ, 0, 1, 00, 01, 10, 11)

$\Sigma = \{aaB, c\}$

$\Rightarrow \Sigma^* = \{\Lambda, aaB, c, aaBaaB, aaBc, caaB, cc \ldots\}$

$\Sigma = \{a, b\}$

$L = \{a, ab\}$

$L^* = \{\Lambda, a, ab, aa, aab, aba, abab, \ldots\}$

a se start hongay magar b ikhte nahi aye gay

↳ Describe this language (logical definition)

null + Language start with a, b will never be placed consecutively

$S = \{a, b, ab\}$

$T = \{a, b, bb\}$

$S^* = \{\lambda, a, b, aa, ab, ba, bb, \ldots\ldots\}$

$\Rightarrow$ They are equal bez of *

$T^* = \{\lambda, a, b, aa, ab, ba, bb, \ldots\ldots\}$

KLEEN (PLUS)(+) Operator

① $4t$ does not accepts Null

②, ③ → same { infinite + all possible combination }

$\Sigma = \{0, 1\}$

$\Sigma^+ = \{0, 1, 00, 01, 10, 11, \ldots\ldots\}$

Theorem S = language

$S^* = S^{**}$

S^* jab kr diya toh sareh combinations agaye toh S^{**} mai bhi wohi hon gai kyu k is k ander all combination hon.

$S^* \subset S^{**}$ → S^* subset hai S^{**} ka toh is k ander sab hi agaye

$S^* \subset S^{**}$, $S^{**} \in S^*$, Hence $S^* = S^{**}$.

Assignment 1

Mon - Solve

TOA

Quiz

$L = \{aa, b\}$

$L^* = ?$

Define language logically

Logically (short form)

Null + all combination of a's and b's where a comes twice always.

(→ Null + even pairs of a's

~~Recursive definition~~

Recursive definition of language

3 steps for recursive definition

① Initialization (Universal truth)

② Formula, Condition (Criteria)

③ Else (No string except those 2 steps, are allowed to be in language)

Step 1

1 is an integer

Step 2

if (x) is an integer then $x+1$, $x-1$ is also an integer

} yeh recursive yeh iterate kr rha hai

Step 3

Nothing else is an integer

Even

① 2 is an even integer

② if X is an even integer then $x+2$, $x-2$ is also an even integer

① $\Sigma = \{a, b\}$

ending in a

Step 1

a is in language

Step 2

S(X) is also in language where $S \in \Sigma^*$

(String)

S(X) => matlab => S jis k and a, b k combination agaye, X means a

② start with b

Step 1 b is on language

Step 2 b(S) .....

containing at least 1 b.

③ Beech mai b aye

S b S $S \in \Sigma^*$

④ an 'a' followed by some b's (may be no b's)

Step 1

a is in laguge.

Step 2

a(S) is in language where $S \in b^*$

follow =>