ATC - Assignment - 3.

1. write a neat diagram & explain the working of turning machine?

Turning machine is a generalized machine which can recognise all types of languages viz, regular languages, context free languages, context sensitive languages.

Turning machine also accepts the languages generalized from unrestricted grammar, turning machile can accept any generalized languages.

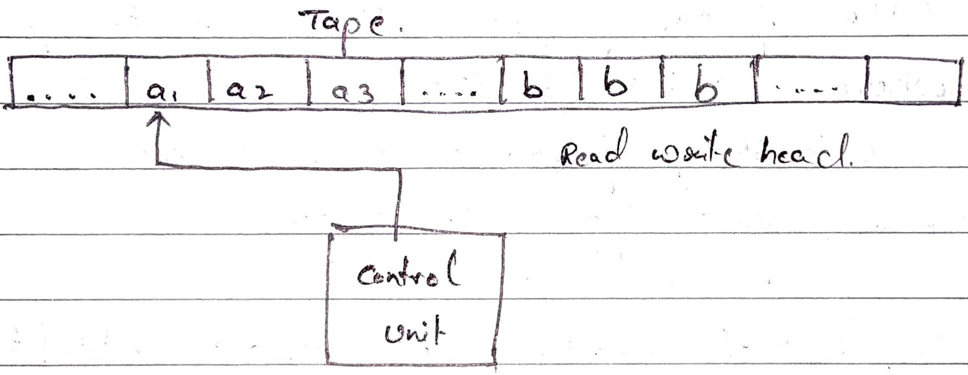
Turning machine model.

* It is a finite automata connected to read-write head with the following components.

(i) Tape

(ii) Read-write head.

(iii) control-unit



Tape:-

* It is a temporary storage and it is divided into cells.
* Each cell can ~~be~~ stored the information of only one symbol.
*

Read-write head:-

* Reading/writing from/to the tape is determined by control unit
* Different moves performed by the machine depends on current scanned symbol & current scanned symbol & current state.
* Various moves performed by the machine.

(2) Define CNF & GNF with an example for each?

CNF (Chomsky Normal form) If a CFG is in CNF if all production rules satisfy one of the following condition.

→ Start symbol generating E

Eg:- $A \to \epsilon$

→ A non terminal generating two non terminals

Eg $S - AB$

Eg:-

$G_1 = \{S \to AB, S \to c, A \to a, B \to b\}$

$G_2 = \{S \to aA, A \to a, B \to c\}$

GNF =

Greibach Normal form.

A context free grammar, $G = (V, T, R, S)$ is said to be GNF if every production is of the form $A \to a\alpha$ where $a \in T$ & $a \in V$.

α is string of zero or more variable.

→ A ~~stan~~ start symbol should generate ϵ

Eg:- $S \to \epsilon$

Eg. $G_1 = \{S \to aAB \mid aB, A \to aA \mid a, B \to bB \mid b\}$

The production rule of Grammar G2 does not satisfy the rules specified from GNF as $A \to \epsilon$, $B \to \epsilon$ contains ϵ.

So the grammar G2 is not in GNF

~~$G = \{S \to aAB$~~

(5) $G_2 = \{S \to aAB \mid aB, A \to aA \mid \epsilon, B \to bB \mid \epsilon\}$.

(3) obtain PDA to accept

$L = \{a^n b^n \mid n \geq 0\}$.

→ if $n = 2$

aabb

(2)

step (i)

$\delta(q_0, \varepsilon, \varepsilon) = (q_0, z_0)$

↳ z_0 is pushed stack is empty

I/P

empty stack.

z_0

(ii) $\delta(q_0, a, z_0) = (q_1, a, z_0)$ push operation.

I/P

Stack

Top of stack.

Stack contents.

a
z_0

(iii) $\delta(q_1, a, a) = (q_1, aa, z_0)$ push operation.

I/P

stack

stack operation.

(iv) $\delta(q_1, b, a) = (q_2, \varepsilon)$ → pop state.

↳ poping.

(v) $\delta(q_2, \varepsilon, z_0) = (q_3, \varepsilon)$ → string accepted.

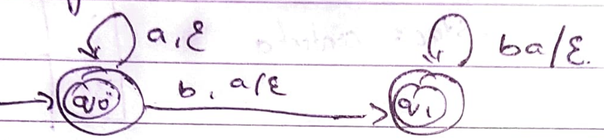
a
a
z_0

} removed.

∴ String is accepted.

sl.no	state	unread i/p	stack	transition.
1	q_0	aabb	z_0	1
2	q_1	abb	az_0	2
3	q_1	bb	aaz_0	3
4	q_2	b	az_0	4
5	q_2	ε	z_0	5
6	q_3.	ε	ε	6.

Diagram Reresssentation



finaly PDA is given by

$M = (Q, \Sigma, T, \delta, q_0, \wedge)$ $\quad Q = \{q_0, q\}$.

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

T = shown above.

4) write the application of pumping lemma for content free langauge?

→ i) Pumping lemma is often used to prone that a given languge L is non content free.

Eg:- $B\{ww \mid w \in \{0,1\}^*\}$ is not content free.

proof:- Assume B is content free Let p be the content from the pumping lemma for B.

Let $w = 0^p 1^p 0^p 1^p$, which is in B.

$w = uvxyz$

1. $|vxy| \leq p$
2. $|vy| > 0$
3. For every $i \geq 0$, $uv^ixy^iz \in B$.

If v contains a symbol from the first 0^p then y ~~contain~~ cannot contain one form the second 0^p so pumping does not work.

i.e hence in general CFL is not closed under Intersected.

(7) Define language acceptibility of TM?

Let $M = (Q, \Sigma, T, \delta, q_0, B, F)$ be a TM

The language $L(M)$ accepted by M is defined as

$L(M) = \{ w \mid q_0 w \vdash^* \alpha_1 p \alpha_2$

where

$w \in \Sigma^*, p \in F$

& $\alpha_1, \alpha_2 \in T^* \}$

i.e set of all those words w in Σ^* which causes M to move from start state q_0 to final state p.

The language acceptible by TM is called recursively enumerable language

→ The string w which is the string to be scanned should end with infinite number of blanks