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DATE 4

\* P*umpind Lemma* \*

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*Gue Stat*e & prov*e pumping lemma Pos Begul*ar set.

Stateme*nt Let M*=(0,2, 6, 70, F) *be a finite automata Loith 'n stetes. let L be the regular set arcepted by M*

let WEL & I

wl=m - if mən then their exist x,y &z such that w=xyZ XE & XyZEL for izo

Poof - Let,

- W=di, dr.

...... dm

mana

S (90 [al, d2.......di]) = qi

G = *3 90*,9.......9m3

It im*plies that is the sequenc*e of state in the pat*h w* a y.. .*.. dm as there are a distinct stat*es at

least two s*tat*es *in a must coincide amon*g the various poiss of *Repeated sta*te.

*consides, the pain Y; & Ek then / kk will sati*sfied *the following condition - o j <k <n. The string* w*ean be*

divided *into three substi*ng -

X --> a, . dj Y ajti ....dk

-> akt

o m such t*h*at

ly/> W=XYZ

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*The path in transition diagram is shown in Figuse* below

osts*ing wis accepte*d by me

Follow*ing conclusion are made from above f*igwe

*1. The automato M stets from initial state 90 fax stsing x it sedches the state aj 03Xk as Y = 4k*.

*2. Fos string y it comes back to aj ice after the application of* y such that iso.

3*. The automata will be in the state aj on applying z it reache* the f*inal state am. Therefore, we conclude that* xyz E*L*

*w*

*Application* of Pumping Lemmd. \*

*Pumping Lemma is extremly useful in proving th*at a *certain set are not regular in following ways* -

**Le Selec**t a *language L*yo*u wish to prove non*-regular.

de Pick 'n' the c*onstant of pumping lemmd select* the string 2 *beak the string into x*, y ez *such that / xx/<n fl*yl> 1 ,

3*. You achieve the contradiction f*or *pumping lemma by showin*g for any x,y ez *that there exist i fox which* xyz is not in L.

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PASSE

*This is a contradiction hense our assumption that hi*s *a regulas language is wrong, Therefore we conclude* that,

*L is not regular language.*

\*

*Problems On Pumping Lemmd \**

\*S-o*g*

W-06

Que*l show that* = 3 o*lin is not regular language*.

Ass*ume L'isc regulan langu*age Let, 'n' be *the no. of states in finite aut*omata which

accept L. *Let w be the string such that.*

Iwlan

W=i2

let in wagn2 |w/= n2 1 n

Condition *is sati*sfied.

in xey &z

Splite the string w

such that

Ixy kn

W=on w=do........

......do

XY

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his

XY=oJ

hat,

Ipt

*Con*sider,

W = x y z

which

W=xz

- Jl k

- J-1tk & n2

&L

W

BL is not a reg*ula la*nguage. Hence our ass*umption that is regulas langu*age is Losong.

We conclude *that is not* segulus language.

P. show that I ogl/i21 } is not regular language.

Assume L' is *a regular langu*age. **let 'n' be the** no. of s*tates in finit*e a*utomata whi*c*h* accept

let w be the string such that

Iwlan

det jen W="1" [w/=nth w/=an

-

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2nan

Condition is satisfied.

such that

Split the staing win x.y

xxlsn.

1x>1

Woo al

let,

xy=of

let,

yot

Conside,

W = xytz

WXZ

n

| = 5-l+k + weh

Hence ous issumption that

3. We conclude that

is a segulas language is wrong. is not a regulas language

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cum 711013 on is prima show that = Zolpisprime } is not regular set.

A*ssume 'I' is a regular language.*

*let Y be the no. of states in finite automata which accept* Lulet w be the string such that

W=of

putp=n. w=on |wlan non

Condition is satisfied.

Split the string win x, yť z *such that*

/xylan

17/>1

n

W: 00

D

oo

ху

xy=of

z=ok

x=gJ-e

Consides,

W = xyz

age is wong nguage

w=x*y®z* W=xz

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w=of- ek

= OJ-L+k

- J-l+k #n WEL

*Flense our assumption that is a segular language is wron*g,

*We* conclude that L is not a segulos, language.

L= 3 b2 [n 1] is not segulos set

*Assume that I'is no la regular language*. *let'n' be the no. of states in finite automata which accepti*.

*let w be the string such that*

Iwan

W = anben (w/=ntan

I wl=3n 3n >n

Gondition is satisfied

split the string w in x, y & z

such that -

1xylsn

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W=an dan

o d'abbbb....bbbb.

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xy= at 2=6k let, - y=al

pe is wrong

Consides,

w=xyz

- put i=o W= x *y z*

W= XZ W = a-l bk

= J-l+k tzn.

-haccept

WEL

Hense Dux assumption that lis il regulas la*nguage* is wong

We conclude that Lis not segules language

3.

L = 3 gen bor n i } is not regular set,

Ass*ume that Lis a regular language.* le*t'be the no. of states is finite automata which accept L*

*let w be the string such that -*

|wlan

(w/= anth

1wl=3n

anan " Condition is satisfied.

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Split the staing Winx, y { z such that -

xylen

ly>

W = 20

Qoga -

aaaabbi

xya Z=bk put,

y=al

Consides,

W=xyz

W=xyz w=XZ

=QT-e bk t = I-lik #3n

W &L

Hense. Dus assumption that Lisa segulas language is wrond.

We conclude that is regulas language.

not

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L=3

-Zan bort na a} is not a regular set.

*Assume that L' is a segulas language Jet 'n be the no. of states in finite automata which accept2 let w be the stsing such that -*

W=an bati

= nun+l | wl= anti

2n+1 >nloa

d

Condition is satisfied

Split the string win x, y ez su*c*h that.

Ixylen

W=an bnti

xy = rent 2=6k

let, 3 y=al x=aI-I

Cons*ider,*

to put iso W = xyz W=XZ

W = a-l bk

J-luk # 2n+1 W & L

Hence ou assumption thot L is a regulas language is waong

.. We conclude that Lis not a segulas language.

\*\_Closue *properties of regula*r set \*

\*5-06

\*\* Que Prove t*hat class of regular set is cl*osed undes union,

concatenation, kleen c*losuse, complementat*ion 4 2orter section.

*→ Unio. +*

let, L. & L2 *dre regular language then thei*r ose *regular expression R & Rg that defines these language then*

*R; + R2 is a regular expsession that defines the language L +1*2 Hence, *the class of Degular set is closed under uni*on.

2 Concatenation2

*The language 4. Le can be defined by regul*as **expression Ri. R2 t**hat defined the language L.**2. Hence, class**

of regulas set is closed under concatenation

3. Kleen closuse +

The language HL\* ( closwe) can be defined by sequiar expuession R closuse R\* Hente, elass of wegulas set is

closed undes kleen closure

w stolas 147

Complementation :

If Lisu segulas language then it is defined as M IQ.2, 4.4, F} be a DFA accepting a language 'l'. Each staing in

seached at the final state of m.ie. it is accepted by DER If we modity the given en constuct anothes DERMthen will represent the language. l' which will be the complement of L

since, Mconstucted is ta seg ulas set then l' is also segular tanquage. Hence the class of Segulas set are closed undex. complementation.

Intussections

Let, L & Ly be egulas language then by demoigan's law 4 ng = . This implies that in Le consist of all staing

that are not in i osts.

Lowexegular then I t we also wegulas IT e segulas then UL is also regulas.

I UL is segulas then I UL is also segulm, but by de-mongan's low 40 12 = 4

Linly is also

regulax language

\* Qu*otient of Langua*ge

*Let, 4 l Lg be two regular. language then quotient of* la*nguage 4* wai*t Ly denoted be* LL

Que. It 4 & Ly be any two language & LED\*10\*

12. = 10

13 = 01 then find 412 8413

wat altplus

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Define quo*tient of languag*e... let l be ot 10"

La be not 23 be o\*

Find 414 & 41123

(4,142 = 0

4/23=0