

Class notes Problem RE, RL, RL

CS & IT ENGINEERING



Theory of Computation

REGULAR LANGUAGE

DPP – 01



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[MCQ]



#Q. Which of the following language is non-regular?

A

$$L = \{wxw^R \mid x, w \in \{a, b\}^*\}.$$

$$\begin{aligned} w = ab & \quad w^R = ba \\ w = \epsilon & \quad w^R = \epsilon \end{aligned}$$

$$\epsilon \cdot (\underbrace{ab^x}_{w} \underbrace{ab}_{x}) \cdot \epsilon$$

$$\begin{aligned} &\Rightarrow \epsilon \cdot (x) w^R(\epsilon) \\ &\Rightarrow \underline{(a+b)^*} \end{aligned}$$

B

$$L = \{wxw \mid w, x \in \{a, b\}^*\}.$$

$$\underline{wxw}$$

$$\begin{cases} w = \epsilon \\ w = \epsilon \end{cases}$$

$$\epsilon \cdot x \cdot \epsilon = x = \underline{(a+b)^*}$$

C

$$L = \{wxwx \mid w, x \in \{a, b\}^+\}.$$

$$\textcircled{\textcircled{X} \textcircled{X}}$$

$$\underline{ab \ ab}$$

D

None of these.

C

[MCQ]



#Q. Consider the following grammar G_1 and G_2 :

G_1 : $S \rightarrow aAb$

$A \rightarrow aB \mid \epsilon$

$B \rightarrow Ab$

G_2 : $S \rightarrow aABb$

$A \rightarrow aA \mid \epsilon$

$B \rightarrow bB \mid \epsilon$

$$aAb = ab$$

If G is RL then it will generate RL
" " " Not RL it may/may not generate RL

$aAb \Rightarrow aabbb$
 $\bar{a}aA\bar{b}\bar{b}$
 $\bar{a}a\bar{a}B\bar{b}\bar{b}$
 $\bar{a}\bar{a}\bar{a}Ab\bar{b}\bar{b} \Rightarrow a^n b^n, n \geq 1$
CFL
 $\#a's = \#b's$
 $a^n b^n, n \geq 1$
 $aAb \Rightarrow a^n b^n$
 $a^n b^n$
 $\Rightarrow a^+ b^+$

Which of the following grammar generates a regular language?

A

G_1 only

B

G_2 only

C

Both G_1 and G_2

D

None of these

$$a' = a \quad \begin{cases} 27 \\ 69 \times 9 \end{cases}$$

#Q. Consider the following three languages:

(1) $L = \{a^{n^n} \mid n \geq 1\}$ $\{a, a^4, a^{27}, \dots\}$

(2) $L = \{a^{m^n} \mid m = n^2, n \geq 1\}$ $a' \{a, a^{4^2}, a^{9^3}, \dots\}$

✓ (3) $L = \{a^{m^n} \mid n \geq 1, m > n\}$ $\{a^{2^1}, a^{3^1}, a^{4^1}, a^{5^1}, \dots\}$

Total number of regular languages is/are ____.

$$\{a^2, a^3, a^4, a^5, a^6, \dots\}$$

①

$$(aa)(a)^*$$

$$a^{3^2}$$

[MCQ]



#Q. Consider the following grammar

G:

$$G = S \rightarrow AB \mid CD \Rightarrow (aa)^*b^* + (aa)^*b^* \Rightarrow (aa)^*b^*$$

$$\begin{aligned} A &\rightarrow aaA \mid \epsilon \Rightarrow (aa)^* \\ B &\rightarrow bB \mid \epsilon \Rightarrow b^* \\ C &\rightarrow aaC \mid \epsilon \Rightarrow (aa)^* \\ D &\rightarrow bD \mid \epsilon \Rightarrow b^* \end{aligned}$$

ANY Lang if DFA, NFA, RE, RS

B

The language generated by above grammar is:

bD
bbD
bbbD

A

Finite X

☒ **B**

Infinite but regular

C

Non-regular X

D

None of these

[MCQ]



#Q. Which of the following language is non-regular?

A

$$L = \{a^{2m} b^n b^n \mid m, n \geq 1\}$$

a^2, a^4, a^6, a^8

$(aa)^+$

$$b^+ b^+ = (bb)^+ \quad b b^* b b^* = (bb)^+ b b^+$$

B

$$L = \{a^m b^n X \mid m, n \geq 1, X \in \{a, b\}^*\}$$

$$a^+ b^+ (a+b)^*$$

C

$$L = \{\{a^{n^2}\}^* \mid n \geq 0\}$$

$$\Rightarrow \{a^{1^2}\}^*, \{a^{2^2}\}^*, \dots$$

D

None of these.

$$\Rightarrow \{a^4\}^* = \{e, a, aa, a^3, \dots\}$$

#Q. Regular expression can be used in:

A Lexical Analysis

B Pattern matching

C String matching

D Syntax analysis

(a.b)

a () a b

[MCQ]



#Q. Consider the regular expression:

regular expression = $a^*b(a + ba^*)^*$

Above regular expression is equivalent to which of the following below regular expression?

A

$ba^*(bb)^*$

~~X~~

B

$ba^*(a + ba^*b)^*$

~~X~~

C

$(b + aa^*b) + (b + aa^*b)(ba^*b + a)(ba^*b + a)^*$

D

$a^*b(a + b)^*$

~~✓~~

$a^*b(a + b)^*$
 $\rightarrow \{b, ab, a^2b^2, \dots\}$

[MCQ]



#Q. Which of the following statement will generate finite language?

A

~~PDA with finite stack.~~



B

Regular expression without kleene star and kleene plus.

$(aa + 2b)$

C

~~Regular expression with unary alphabet.~~

$\{a\}^*$

D

~~Regular expression with binary alphabet.~~

$\{0,1\}^*$

[MCQ]



#Q. Consider following regular expressions:

[I] ~~$(ab)^*a = a(ab)^*$~~

☒ [II] ~~$(bb)^*b^* = b^*$~~

☒ [III] ~~$(b + \epsilon)^+ = b^*$~~

$\{bb\}^* = \epsilon, b^2, b^4, \dots$
 b^3, b^5, \dots

Which of the following is correct?

☒ **A**

II and III only.

B

I and II only.

C

All are correct.

D

None of these are correct.

[MCQ]



#Q. For $L = \{a^n b^m \mid n, m \geq 0\}$
What will be the regular expression ?

A $(a^*b^*)^* \Rightarrow (a+b)^*$

C $(ab)^* \Rightarrow \underline{abab} \dots$

B (a^*b^*)

D $(b^*a^*) \Rightarrow \underline{bbaa} \dots$

[MCQ]



#Q. Consider the following regular expressions:

~~(I) $(aa + aaa)^* = aa^+$~~

(II) $(a^*b(a+b)^* + (a^*b^*)^*) = (a+b)^*$ ✓

~~(III) $(\epsilon + aaa(aaa)^*)(\epsilon + a + aa) = (a + aa + aaa)^*$~~

Which the following is correct?

A

(I) and (III) only. ~~X~~

B

(II) and (III) only.

C

All are correct. ~~X~~

D

None of these are correct.

#Q. Which of the following is/are regular expression for the language:
 $L = \{\text{Containing } \underline{ab} \text{ as a substring}\}$

$L = \{ab, .abb\}$

bab

(a, c, d)

~~A~~

$b^*aa^*b(a^*b^*)^*$

$\Rightarrow b^*aa^*b(a+b)^*$
 $\epsilon \quad a \quad \epsilon \quad b \quad \epsilon = ab$

B

$(a+b)^*(ab)^*(a+b)^*$

$\epsilon \quad \epsilon \quad \epsilon = \epsilon$

~~C~~

$(a^*b^*)^*ab(a^*+b^*)^*$

$(a+b)^* \underline{ab} (a+b)^*$

~~D~~

$(a+b)^*ab(a+b)^*$

$b^*a^*b^* \Rightarrow ab$

[MCQ]



#Q. What will be the regular expression for $L = \{a^{2n} \mid n \geq 15\}$ over $\Sigma = \{a\}$

$$\{a^{2 \cdot 15}\} = a^{30}, a^{32}, a^{34}, \dots$$

A $a^{15}(aa)^*$ X

B $(aa)^* a^{15}$ X

C $a^{30}(aa)^*$

D None of these

$$\begin{aligned} &= a^{30}(aa)^* \\ &a^{30} \in a^{30} \\ &= a^{30}aa = a^{32} \end{aligned}$$

[MCQ]



#Q. Which of the following string does not belong to $(ab^*)^*$?

A aaabbaa

B baaaabb

C aaabbb

D ababa

$ab^*ab^*ab^*ab^*$
aaabbaa

$(ab^*)^*$
aaabbaa

$ab^*ab^*ab^*$
ababa

14 Q

All Ques come from CN

WT, DPP, (PYQ) → 90% CN

THANK - YOU

Revision, PCN,

