CS & IT ENGINEERING

Theory of computation

Regular Languages

DPP 03 Discussion Notes

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TOPICS TO BE COVERED

01 Question

02 Discussion

For $L = \{a^n b^m \mid n, m \geq 0\} = \{\varepsilon, a, aa, \cdots, b, bb, \cdots, a^+ b^+\}$ $n \geq 0$
$m \geq 0$

What will be the regular expression?

[MCQ]

A. $(a^*b^*)^* = (a+b)^*$ $\times$

B. (a^*b^*) $\checkmark$

C. $(ab)^*$ $\times$

D. (b^*a^*) $\times$

$a^m b^n$

$\varepsilon \quad m=0, n=0$

$a^+ \quad m>0, n=0$

$b^+ \quad m=0, n>0$

$a^+ b^+ \quad m>0, n>0$

Union

$\boxed{a^* b^*} \quad m \geq 0, n \geq 0$

Q.2
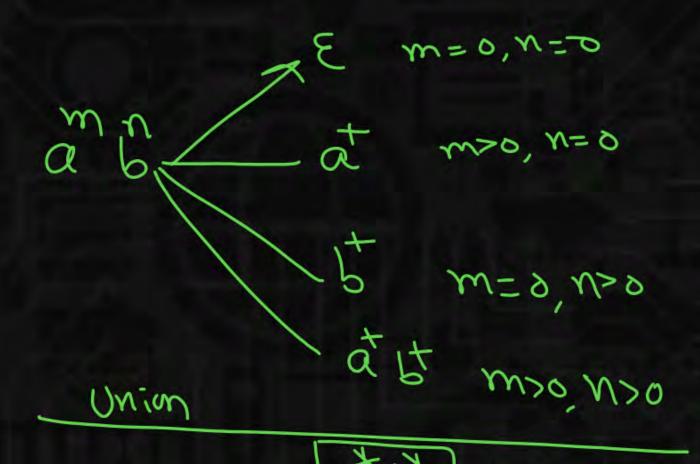
Consider the following regular expressions:

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

(II) $(a^*b\,(a+b)^* + (a^*b^*)^*) = (a+b)^*$

(III) $(\varepsilon + aaa\,(aaa)^*)\,(\varepsilon + a + aa) = (a + aa + aaa)^*$

Which the following is correct?

[MCQ]

A. (I) and (III) only.

B. (II) And (III) only.

C. All are correct.

D. None of them are correct.

(Handwritten annotations:)

$\varepsilon\checkmark,\ \breve{a},\ a\breve{a},\ ^\cap$ $aaa,\ \cdots$

$= a^*$

I) $\underbrace{(aa+aaa)}_{\substack{\downarrow\\ min=\varepsilon}}^* = \underbrace{aa}_{min=aa}^+\ ?$

II) $\underbrace{\left[\ a^*b\,(a+b)^*\ +\ \underbrace{(a^*b^*)^*}_{}\ \right]}_{any} = (a+b)^*$

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

Q.3 Which of the following is/are regular expression for the language:

L = {Containing ab as a substring}

[MSQ]

$$= \{ w \mid w \in \{a,b\}^*, \ w \text{ contains } ab \}$$

A. $b^* aa^*b (a^*b^*)^* = b^* aa^* b (a+b)^*$ ✓

B. $(a + b)^* (ab)^* (a + b)^*$ — min $= \varepsilon$
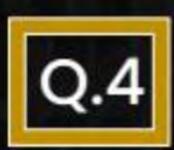
C. $(a^* b^*)^* ab (a^* + b^*)^* = (a+b)^* ab (a+b)^*$

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

Q.4

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

[MCQ]

A. $a^{15}(aa)^*$ ✗

B. $(aa)^* a^{15}$ ✗

C. $a^{30}(aa)^*$ ✓

D. None of these

$$L = \left\{ a^{2n} \mid n \geq 15 \right\}$$

$$L = \left\{ a^{30}, a^{32}, a^{34}, \ldots \right\}$$

$$= \left\{ a^{30} \cdot \varepsilon, \; a^{30} \cdot a^{2}, \; a^{30} \cdot a^{4} \ldots \right\}$$

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

Q.5

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

[MCQ]

$$(ab^0)^1 (ab^0)^1 (ab^2)^1 (ab^0)^1 (ab^0)^1$$

$$L = (ab^*)^*$$

$$= \{\varepsilon, a, ab, aa, \dots\}$$

A. aaabbaa

B. baaaabb — not possible

C. aaabbb

D. ababa