Yashasvi Jaiswal CS-2
18114083

Assignment -3

classmate
Date
Page

Q1

(a) $a^n b^m$ $n \geq 4$, $m \leq 3$

$(aaaa)a^*(\lambda + b + bb + bbb)$

(b) $a^n b^m$ $(n+m)$ is even

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

(c) $a^n b^m$, $n \geq 3$, m is even

$(aaa)a^*(bb)^*$

(d) $a^n b^m$ $n<4, m \leq 3$

$(\lambda + a + aa + aaa)(\lambda + b + bb + bbb)$

(e) $ab^n w : n \geq 3$ $w \in \{a,b\}^+$

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

(f) $vwv : v, w \in \{a,b\}^*, |v| = 2$

$(a+b)^*$

(g) $w \in \{0,1\}^*$

~~$(0+1)^*$ $(0+1)^*$~~

~~$1^*(011^*)^* 00 (110^*)^* 1^*$~~ X

$$((1+01)^* 00 (1+10)^*$$

(h) Complement of $a^{2n} b^{2m+1}$, $n \geq 0$, $m \geq 0$

$a^2b, a^4b, a^6b \ldots, b, b^3, b^5, \ldots$

even powers of a and odd powers of b

complement → ~~odd powers of a & even powers of b~~

$a^{2n} b^{2m}$, $m \geq 0$, $n \geq 0$ $\cup$ $a^{2n+1} b^{2m}$ $m \geq 0$, $n \geq 0$

$\epsilon, a^2, a^4, a^6 \ldots b^2, b^4, b^6 \ldots, a^2b^2$ $\cup$ $a, a^3, a^5 \ldots ab^2$

$a^n b^{2m}$ $n \geq 0$, $m \geq 0$

$(a)^* (bb)^*$

(i) Complement of $L = a^n b^m$ $n \geq 4$ $m \leq 3$

→ $L = a^n b^m$ $n < 4$ $m > 3$

$(\lambda + a + aa + aaa)(bbbb)b^*$

(j) Complement of $L = a^n b^m$ $n < 4$ $m \leq 3$

→ $L = a^n b^m$ $n \geq 4$ $m > 3$

$(aaaa)a^*(bbbb)b^*$

Q2 $\Sigma = \{a, b, c\}$

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

(b) $(b+c)^*(a+\lambda)(b+c)^*(a+\lambda)(b+c)^*(a+\lambda)(b+c)^*$

(c)

(d) ~~$(b+c)^* + (b+c)^*((a+aa)(b+c)^+)^*(a+aa)(b+c)^*$~~

~~(e) $(b+c)^*((aaa)(b+c)^*)^*$~~

(c) possible orders

abc + acb + bac + bca + cab + cba

$X = (a+b+c)^*$

ans ⇒ $XaXbXcX + XaXcXbX + XbXaXc$

$+ XbXcXaX + XcXaXbX + XcXbXaX$

(d) $(b+c)^*(\Lambda+a+aa)(b+c)^*$

$((b+c)(b+c)^*(\Lambda+a+aa)(b+c)^*)^*$

(e) $(aaa+b+c)^*$

Q3 $\Sigma = \{0,1\}$

(a) $(0+1)^*01$

(b) $(0+1)^*0 + (0+1)^*11 + \Lambda + 1$

(c) $1^* + (1^*01^*0)^*1^*$

classmate

Date

Page

(d) $(1+0)^* 00 (1+0)^* 00 (1+0)^*$

$+ (1+0)^* 000 (1+0)^*$

(e) 3 cases

↳ 0 occurence, 1 occurrence, 2 occurrence

$(1+01)^* (\lambda + 00 + 000 + 0011^* 00)(1+10)^*$

(f) $0^* (1^* 000^*)^* 1^* 0^*$

Q4 $\Sigma = \{a, b\}$

(a) $w : |w| \bmod 3 = 0$

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

(b) $w : n_a(w) \bmod 3 = 0$

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

(c) $w : n_a(w) \bmod 5 > 0$

$$\left[(b^*ab^*) + (b^*ab^*ab^*) + (b^*ab^*ab^*ab^*) + (b^*ab^*ab^*ab^*ab^*) \right]^* + \cancel{b}$$

$$\left[b + (ab^*ab^*ab^*ab^*a) \right]^*$$

$$\Sigma = (a, b, c)$$

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

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

(c) $$\left[((b+c)^*a(b+c)^*) + ((b+c)^*a(b+c)^*a(b+c)^*) + ((b+c)^*a(b+c)^*a(b+c)^*a(b+c)^*) + ((b+c)^*a(b+c)^*a(b+c)^*a(b+c)^*a(b+c)^*) \right] +$$

$$\left[(b+c) + (a(b+c)^*a(b+c)^*a(b+c)^*a(b+c)^*a) \right]^*$$