Quiz 1

Student ID:..... **SEC:**..... Duration: 20 minutes **CSE331**

Name:..... Total Marks: 20 SET All

Problem 1. Let Σ = {0, 1}. Give regular expressions generating each of the following languages over Σ.

(a) {w: w contains exactly two "00" substring}

Ans. $1^+(01^+)^*001^+(01^+)^*001^+(01^+)^* \cup 1^+(01^+)^*0001^+(01^+)^*$

(b) {w: w starts with 11 and the substring 11 appears only once in the string}

Ans. $11(0^+1)^*0^*$

(c) {w: w has odd number of 0's and ends with 1}

Ans. $1^*0(1^*01^*0)^*1^+$

(d) {w: w contains neither 00 nor 11}

Ans. $(1 \cup \varepsilon)(01)^*(0 \cup \varepsilon)$

(e) {w: w ends in 11 and total number of 1 is divisible by 3}

Ans. $(0^*10^*10^*1)^*0^*10^*11$

(f) {w: substring '11' appears exactly once in w}

Ans. $0^*(10^+)^*11(0^+1)^*0^*$

(g) {w: w contains an odd number of 1's and does not end with 1}

Ans. $(0^*10^*1)^*0^*10^+$

(h) {w: w starts with 11 and substring '11' appears exactly once}

Ans. $11(0^+1)^*0^*$

(i) {w: 10 appears an even number of times in w}

Ans. $0^*(1^+0^+1^+0^+)^*1^*$

(j) {w: 0^m1^n; where m+n is even}

Ans. $(00)^*(11)^* \cup (00)^*0(11)^*1$

(k) {w: w ends with substring "00" and "00" substring appears only once in w}

Ans. $1^*(01^+)^*00$

(l) {w: w has 1s in positions 1, 4, 7, 10 . . . and a length that is two more than a multiple of three}

Ans. $1(\Sigma\Sigma1)^*\Sigma$

(m){w: every 2nd letter of w is 0 and length of w is odd}

Ans. $\Sigma(0\Sigma)^*$

(n) {w: every 1 in w is followed by at least two 0's }

Ans. $0^*(1(00)^+)^*$

(o) {w: w starts with 1 and does not end with 01}

Ans. $1\Sigma^*(0 \cup 11)$

(p) {w: w starts with 0, ends with 1 and has an even length}

Ans. $0(\Sigma\Sigma)^*1$

(q) {w: the last letter of w appears at least twice in w}

Ans. $(\Sigma0\Sigma)^*0 \cup (\Sigma1\Sigma)^*1$

(r) {w: "11" substring appears at most once}

Ans. $0^*(10^+)^*(0^+1)^*0^* \cup 0^*(0^+1)^*(10^+)^*0^* \cup 11$

(s) {w: w contains at least one 1 and one 0}

Ans. $\Sigma^*1\Sigma^*0\Sigma^* \cup \Sigma^*0\Sigma^*1\Sigma^*$

(t) {w: w does not have substring "010"}

Ans. $1^*0^*1^* \cup (0^*11^+0^*)^*(1 \cup \varepsilon)$

(u) {w: each 1 in w is preceded by a 0}

Ans. $0^*(01)^*0^*$