

PROBLEM SET 8

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Question 1 Convert the following to a regular expression.

ANSWER: Part a) $L = \{ w \in \{0, 1\}^* \mid \text{The number of 0's in } w \text{ is a multiple of 3} \}$

$$r: (1^*01^*01^*01^*)^*$$

This follows the required language. The binary string can have any number of 1's preceding it followed by a 0. There can then be any number of 1's followed by a 0 once again. This process is repeated again giving a string with exactly three 0's. This entire process can be repeated multiple times (or not at all) leaving us a string with a multiple of three 0's.

ANSWER: Part b) $L = \{ w \in \{a, b, c\}^* \mid w \text{ contains both } ab \text{ and } cc \text{ as sub strings} \}$

$$r: (a+b+c)^*ab(a+b+c)^*cc(a+b+c)^* + (a+b+c)^*cc(a+b+c)^*ab(a+b+c)^*$$

This follows the required language. The initial string can be an a, or b, or c which is then repeated (or not created at all) and unlimited number of times. The string ab is then required. Another set of characters in the alphabet are expected, followed by the string cc. Lastly, another set of characters from the alphabet is expected. This entire process could also be changed to have the string cc appear before the string ab.

Question 2 Convert the following to English.

ANSWER: Part a) $((0 + 1)(0 + 1)(0 + 1)(0 + 1))^*$

$$||w|| \% 4 = 0$$

ANSWER: Part b) $(0^*10^*10^*)^*1(0^*10^*10^*)^*$

w has an odd number of 1's, $w \neq \varepsilon$

ANSWER: Part c) $a^*b(b+a)^*c(c+b+a)^*+a^*c(c+a)^*b(c+b+a)^*$

w must contain sub strings b and c