Your solutions need to be handwritten. After writing down your solutions, scan and compile them into a single pdf file. Details on where and how to upload your solutions are on buX.

Problem 1
Write down regular expressions for the following languages.

(a) $\{w \in \{0,1\}^* : w$ does not end in $101\}$ (2 points)

(b) $\{w \in \{a, b, c\}^* : w$ starts with $\mathtt{abba}$ and ends in $\mathtt{bac}\}$ (2 points)

(c) $\{w \in \{a, b\}^* :$ the number of $\mathtt{a}$s in w is 1 more than a multiple of 3$\}$ (3 points)

Problem 2
Describe the languages that the following regular expressions generate. Keep in mind that a '$+$' is the same as a '$\cup$'. Each problem is worth 1 point each.

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

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

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

Problem 3
Construct deterministic finite automata for the following languages.

(a) $\{w \in \{0,1\}^* : w$ contains exactly two 0s$\}$ (2 point)

(b) $\{w \in \{0,1\}^* : w$ contains an even number of 0s and an odd number of 1s$\}$ (2 points)

(c) $\{w \in \{0,1\}^* :$ the length of w is even and w contains 0s at all the odd positions$\}$ (3 points)

(d) $\{w \in \{0,1\}^* : w$ contains 01^m0 as a substring where m is divisible by 3$\}$ (3 points)