

Your answers should be typed or neatly written on clean paper.

1) Find a regular expression for each of the following languages over $\Sigma = \{a, b\}$

- a) $\{w \mid \text{the length of } w \text{ is } 6\}$ //don't list all 64 individual strings
- b) $\{w \mid w \text{ begins and ends with different symbols}\}$
- c) $\{w \mid w \text{ does not contain } ab \text{ as a substring}\}$
- d) $\{w \mid \text{every } a \text{ in } w \text{ is immediately followed by a } b\}$
- e) $\{w \mid w \text{ contains alternating symbols}\}$ //alternately, does not contain either aa or bb as substrings

2) For each of the following languages, describe in English the language that it represents.

- a) $(0 + 1)^*01$
- b) 1^*01^*
- c) $(11)^*$
- d) $(0^*10^*10^*)^*$
- e) $0^*(1 + 000)^*0^*$

3) For each of the languages in question 1, construct a deterministic FSA that accepts it.

4) For each of the following regular expressions, construct an FSA (either deterministic or non-deterministic) that accepts the same language.

- a) $a(a + b)^*b$
- b) $1(0 + 1)^*0 + 0$
- c) 0^*10^*
- d) $0^*(1 + \epsilon)0^*$
- e) $a + b + a(a + b)^*a + b(a + b)^*b$

5) For each of the following FSAs, describe in English the language that it accepts.

