# ToC Spring 2022

# Practice Problems -1

1. Textbook, Page 83, Exercise 1.4. Draw **DFA** for:

(a) i. {*w*| *w* has at least three a’s}

* 1. {*w*| *w* has at least two b’s}
  2. {*w*| *w* has at least three a’s and at least two b’s}

(b) i. {*w*| *w* has exactly two a’s}

1. {*w*| *w* has at least two b’s}
2. {*w*| *w* has exactly two a’s and at least two b’s}

(c) i. {*w*| *w* has an even number of a’s}

ii. {*w*| *w* has one or two b’s}

# {*w*| *w* has an even number of a’s and one or two b’s}

1. i. {*w*| *w* has an even number of a’s}
   1. {*w*| each a in *w* is followed by at least one b}
   2. {*w*| *w* has an even number of a’s and each a is followed by at least one b}
2. i. {*w*| *w* starts with an a}
   1. {*w*| *w* has at most one b}
   2. {*w*| *w* starts with an a and has at most one b}
3. i. {*w*| *w* has an odd number of a’s}
   1. {*w*| *w* ends with a b}
   2. {*w*| *w* has an odd number of a’s and ends with a b}
4. i. {*w*| *w* has even length}
   * 1. {*w*| *w* has an odd number of a’s}
     2. {*w*| *w* has even length and an odd number of a’s}

2. Textbook, Page 84, Exercise 1.7. Draw **NFA** for:

# (a) The language {*w*| *w* ends with 00} with three states

1. The language {0} with two states
2. The language 0∗1∗0+ with three states
3. The language 1∗(001+)∗ with three states
4. The language {*ε*} with one state
5. The language 0∗ with one state

3. Write the **RE** for:

* + 1. {*w*| *w* begins with a 1 and ends with a 0}
    2. {*w*| *w* contains at least three 1s}
    3. {*w*| *w* contains the substring 0101, i.e., *w* = *x*0101*y* for some *x* and *y*}
    4. {*w*| *w* has length at least 3 and its third symbol is a 0}
    5. {*w*| *w* starts with 0 and has odd length, or starts with 1 and has even length}
    6. {*w*| *w* doesn’t contain the substring 110}