These questions are largely taken from Sipser's book [1].

1. Draw a DFA that recognises all strings over $\{a, b\}$ that have at least three a's.
2. Draw a DFA that recognises all strings over $\{a, b\}$ that have at least two b's.
3. Draw a DFA that recognises all strings over $\{a, b\}$ that have exactly two a's.
4. Draw a DFA that recognises all strings over $\{a, b\}$ that have an odd number of a's.
5. Draw a DFA that recognises all strings over $\{a, b\}$ that have at least three a's and at least two b's.
6. Define all of the above DFA's.
7. Draw an NFA that recognises any string over $\{0, 1\}$ that begins with a 1 and ends with a 0 or contains at least three 1's.
8. Draw an NFA that recognises strings over $\{0, 1\}$ that contains the substring 0101 or doesn't contain the substring 110.
9. Draw an NFA that recognises strings over $\{0, 1\}$ that are the concatenation of strings of length at most five and strings where every odd position is a 1.
10. Draw an NFA that recognises strings in the Kleene star of the language over over $\{0, 1\}$ containing only strings with at least two 0's and at most one 1.
11. Define all of the above deterministic finite automata.
12. Use the pumping lemma to show that the following language over the alphabet $\{0, 1\}$ is not regular.
$$L = \{0^n 1^n \mid n \in \mathbb{N}\}$$
13. Use the pumping lemma to show that the following language over the alphabet $\{0, 1\}$ is not regular.
$$L = \{w \mid w\text{has an equal number of 0's and 1's}\}$$

References

[1] Michael Sipser. *Introduction to the Theory of Computation.* International Thomson Publishing, 3rd edition, 1996.