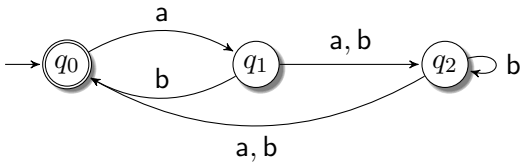
Provide an answer to each questions in the corresponding box. If you run out of space for an answer, continue on the back of the page. This test is individual and must be answered without the use of any supporting material, under penalty of being considered null, without prejudice to other disciplinary measures. Please write your **Name** and **Number** on each sheet.

Name: _____ Nr: _____

1. Draw the diagram of a complete determinisitic finite automaton (DFA), accepting the language, of alphabet $\{1, 0\}$, whose words end with the subword 101.

2. Consider the nondeterministic finite automaton (NFA), of alphabet $\{\mathsf{a}, \mathsf{b}\}$, represented by the following diagram.

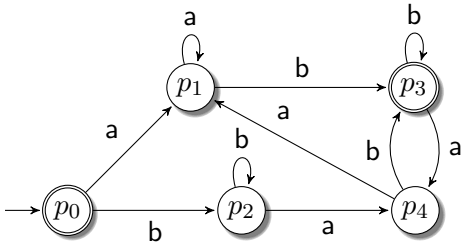


   (a) Find, by the subset construction, an equivalent complete DFA, giving a table and designing its diagram. Each state of the DFA should be identified by a subset of states of the NFA.

   (b) Obtain an equivalent regular expression using the method of state elimination. Design the automaton after eliminating each state.

3. Consider the regular expression $r = (\mathsf{ab}^\star + \mathsf{b})^\star\mathsf{ba}$. Design the diagram of a DFA equivalent to r. Either use the Brzozowski's derivative method, or Thompson's method followed by subset construction for ε-NFAs. Present the steps of the construction.

4. Using Moore's algorithm, draw the diagram of the minimal DFA equivalent to the DFA, of alphabet $\{\mathsf{a}, \mathsf{b}\}$, depicted below. Justify the pairs of states that are distinguishable and give the equivalent classes obtained.



5. Answer **only** one of the following questions:

   (a) Show that the language $L_1 = \{1^n 01^n \mid n \geq 0\}$ of alphabet $\{1, 0\}$ is not regular.

   (b) Show that the following language is regular giving a regular expression that represents it:

$$L_2 = \{x \in \{1, 0\}^\star \mid x \text{ does not contain the subword } 110 \text{ or the subword } 00\}$$