1. [54] Consider the following grammar G:

   \[ S \rightarrow 1AS \mid B \]
   \[ A \rightarrow 2A \mid 2 \]
   \[ B \rightarrow 3B \mid 3 \]

If G is a grammar of the following classification, give the appropriate parsing table; if not, precisely prove why it is not of that classification. (9 points for each- 1 point for correct answer and 8 points for proof or parsing table)

   (a) LL(0)
   (b) LL(1)
   (c) LR(0)
   (d) LR(1)
   (e) SLR(1)
   (f) LALR(1)

2. [21] Consider the following state diagram:

   \[ \begin{array}{c}
   0 \\
   \end{array} \]
   \[ \begin{array}{c}
   1 \\
   \end{array} \]

   (a) Give the DFSA for this state diagram
   (b) Give the minimized DFSA for this state diagram
   (c) Give a regular grammar that accepts the same set as this state diagram

3. [7] Prove that a grammar which is left recursive cannot be LL(1).

4. [10] Prove that the set \{a^n b^{n^2}\} (i.e., n a’s followed by n^2 b’s) cannot be recognized by a push down automaton.

5. [8] Show that the set of integers divisible by 7 is a regular set.