1. Which ones of the following statements are true and which ones are false? [16]
   (a) If \( L_1 \subseteq L_2 \) and \( L_1 \) is not regular, then \( L_2 \) is not regular.
   (b) If \( L_1 \) and \( L_2 \) are nonregular, then \( L_1 \cup L_2 \) is nonregular.
   (c) \( (L^+)^* = L^* \).
   (d) \( S \subseteq \Lambda(S) \).
   (e) \( S \rightarrow aSa \mid bSb \mid \Lambda \) generates all palindromes over \( \{a, b\} \).
   (f) \( (a + b)^*ab(a + b)^* + b^*a^* = (a + b)^* \).
   (g) \( aaa \) is in the language represented by \( ab^* + ba^* + b^*a + (a^*b)^* \).
   (h) \( \{a^n b^n \mid n \in N \} \) is accepted by a PDA.
   (i) The set of all odd-length strings in \( \{a, b\}^* \) with middle symbol 'a' is generated by a context-free grammar.
   (j) Every (Turing-)acceptable language is (Turing-)decidable.

2. Prove by general induction that \( Rev(Rev(x)) = x \) for an arbitrary string \( x \) in \( \{a, b\}^* \). \( Rev(x) \) is defined as follows: [16]

   Basis Clause: \( Rev(\Lambda) = \Lambda \)
   Inductive Clause: For any string \( x \in \{a, b\}^* \) and any symbol \( c \) in \( \{a, b\} \), \( Rev(xc) = cRev(x) \).
3. Prove that $L = \{0^i1^j \mid j \text{ is a multiple of } i\}$ is nonregular by Myhill-Nerode.

4. Find an example of a nonregular language $L \subseteq \{a, b\}^*$ so that $L^*$ is regular.

5. Decide whether or not the following statement is true and give your reason:

If $L_1$ is regular, $L_2$ is nonregular and $L_1 \cap L_2$ is regular, then $L_1 \cup L_2$ is nonregular.
6. Using the basic Turing machines $T_a, T_b, T_R, T_L, T_{\Delta}, T_{L_{\Delta}}, T_{R_{\Delta}}$ etc., construct a Turing machine that copies a given string over the alphabet $\{a, b\}$ i.e. a Turing machine that goes from $(q_0, \Delta w)$ to $(h, \Delta w \Delta w)$. [20]