1. **10 points** Give the transition diagram for a Turing machine that accepts the following language:

\[ L = \{a^n b^{2n} c^{4n} | n \geq 1\} \]

2. **10 points** Create a multi-track Turing Machine that will determine a string containing an equal number of 0’s, a’s, and u’s.

3. **10 points** A common operation in Turing-machine (TM) programs involves “shifting over.” Ideally, we would like to create an extra cell at the current head position, in which we could store some character. However, we cannot edit the tape in this way. Rather, we need to move the contents of each of the cells to the right of the current head position one cell right, and then find our way back to the current head position. Show how to perform this operation for a normal TM.

4. **10 points** Design a subroutine to move the TM head from its current position to the right, skipping over all 0’s, until reaching a 1 or a blank. If the current position does not hold 0, then the TM should halt. You may assume that there are no tape symbols other than 0, 1, and B (blank). Then, use this subroutine to design a TM that accepts all strings of 0’s and 1’s that do not have two 1’s in a row.