**MAU22C00: TUTORIAL 21 PROBLEMS**
**TURING MACHINES**

1) Consider the language over the binary alphabet $A = \{0, 1\}$ given by

$$L = \{(01)^m \mid m \in \mathbb{N}\} = \{\epsilon, 01, 0101, 010101, \dots\}.$$

(a) Draw a finite state acceptor that accepts $L$. Be sure to carefully label the initial state, the accept states, and all the transitions.

(b) Write down the algorithm of a Turing machine $M$ that recognizes $L$.

(c) Draw the transition diagram of the Turing machine $M$ from part (b). How is it different from the finite state acceptor you drew in part (a)?

2) Consider the language over the decimal digits

$$A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

given by $L = \{3m \mid m \in \mathbb{N}\}$. Write down the algorithm of a Turing machine that **decides** $L$. Process the following strings according to your algorithm: 0, 1, 5, and 9.