

## GEM 1501 Problem Solving With Computers

### Assignment 04: Turing Machines; Semaphores

1. Design a Turing machine that decides whether the letters **a**, **b**, and **c** occur in this order in a given string. You can assume that the tape of the machine contains only letters **a**, **b**, **c** and **#**. The machine will analyse the string of letters **a**, **b**, and **c** from the initial head position of the tape to the right until the first occurrence of the letter **#**.

Example: If the tape looks like this

`...bcbacacbacacba#...`

and if the head initially points to the first **b**, the machine will recognise the presence of the letters **a**, **b**, and **c** in this order.

To indicate the answer, the machine will finish in state “yes” if the given string has the letters **a**, **b**, and **c** in this order, and in state “no” otherwise.

2. Design a correct solution to the 2-philosophers problem using semaphores. How many semaphores do you need?