KING SAUD UNIVERSITY COLLEGE OF COMPUTER AND INFORMATION SCIENCES Computer Science Department		
CSC 339 **Theory of Computation**	**Tutorial # 6** Turing Machine (TM)	**2^{nd} Semester 1443-2022**

Exercise 1

Let $\boldsymbol{M} = (\boldsymbol{Q}, \boldsymbol{\Sigma}, \boldsymbol{\Gamma}, \#, \boldsymbol{q0}, \boldsymbol{F}, \boldsymbol{\delta})$ be a Turing machine where:

- $Q = \{q0, q1, q2\}$
- $\Sigma = \{a, b, c\}$
- $\Gamma = \{a, b, c, \#\}$
- $F = \{q2\}$

$\boldsymbol{\delta}$	a	b	c	#
$q0$	$q0, a, R$	$q0, c, R$	$q0, c, R$	$q1, \#, L$
$q1$	$q1, c, L$	-	$q1, b, L$	$q2, \#, R$
$q2$	-	-	-	-

1. Trace the computation for the input string $\boldsymbol{aabca}$.
2. Trace the computation for the input string $\boldsymbol{bcbc}$.
3. Give the state diagram of M.
4. Describe the result of a computation in M.

Exercise 2

Construct a Turing machine with input alphabet $\{a, b\}$ to perform each of the following operation:

1. Return $\boldsymbol{E}$ if the length of the input string is even, and $\boldsymbol{O}$ if the length is odd.
2. Construct a copy of the reversed input string and concatenate it to the input.
3. Erase the $b's$ from the input.