## University of Waterloo Department of Electrical and Computer Engineering Fall, 2022

## ECE 203: Probability and Statistics 1

# MIDTERM EXAMINATION

Surname				
Legal Given Name(s)	 	 	 	 
UW Student ID Number				

#### Instruction:

- 1. There are 100 points in total.
- 2. This is a written, open-book exam. Please turn off all electronic media and store them under your desk.
- 3. Be neat. Poor presentation will be penalized.
- 4. No questions will be answered during the exam. If in doubt, state your assumption(s) and proceed.
- 5. Do not leave during the examination period without permission.
- 6. Do not stand up until all the exams have been picked up.

Do well!

## Question 1 (30 points)

A class is divided into three groups on the basis of the preferred subjects of the students. The first group has 20 students, out of which 5 like mathematics. The second group has 12 students, out of which 7 like mathematics. The third group has 18 students, out of which 3 like mathematics. Find the probability of selecting a student randomly from one of the three groups who likes mathematics.

## Question 2 (35 points)

An urn contains n red and m blue balls. They are withdrawn one at a time until a total of r (with  $r \leq n$ ) red balls have been withdrawn. Find the probability that a total of k balls are withdrawn. *Hint*: A total of k balls will be withdrawn if there are r - 1 red balls in the first k - 1 withdrawals and the k-th withdrawal is a red ball.

## Question 3 (35 points)

Consider two boxes, one containing 1 black and 1 white marble, the other 2 black and 1 white marble. A box is selected at random, and a marble is drawn from it at random as well. What is the probability that the marble is black? What is the probability that the first box was the one selected given that the marble is white?