Name: _____   Tutorial group: <u>T1</u>

Matriculation number:

<u>INSTRUCTIONS</u>

1. Do not turn over the pages until you are told to do so.

2. Write down your name, tutorial group, and matriculation number.

3. This test paper contains **FOUR (4)** questions and comprises **FIVE (5)** printed pages.

4. Answer **all** questions. The marks for each question are indicated at the beginning of each question.

5. You are allowed one double sided A4 size cheat sheet.

QUESTION 1. (6 marks)

An urn contains five red balls and two white balls. Three balls are drawn without replacement from the urn, and the colours are noted in sequence.

Let A be the event that the second ball drawn is white. Find $P(A)$. Leave your answer as a fraction.

QUESTION 2. (12 marks)

There are 2 bad batteries in a given lot of 100 batteries.

a An inspector examines 3 batteries which are selected at random and without re-placement. Find the probability of at least 1 bad battery among the 3. Leave your answer as a fraction or correct to three significant figures.

b Suppose the inspector examines batteries selected at random but with replacement. What is the minimum number of batteries that he should examine so that the probability of finding at least 1 bad battery is at least $\frac{1}{2}$?

QUESTION 3.   **(8 marks)**

Let A, R, S, T be events of a certain experiment such that R, S, T are mutually disjoint and $R \cup S \cup T = \Omega$. Suppose $P(A|R) = 0.75$, $P(A|S) = 0.2$, $P(A|T) = 0.5$, $P(R) = 0.60$, $P(S) = 0.25$, and $P(T) = 0.15$.

Find $P(R|A)$. Leave your answer as a fraction or correct to 3 significant figures.

QUESTION 4. (8 marks)

Three components, A, B, and C, are connected in the way illustrated below. Assume that all three units are independent, units A and B each fails with probability 0.1, and unit C fails with probability 0.2. What is the probability that the system works?