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| **School of Mathematical Sciences**  **Assignment Cover Sheet**  **MATHS: Probability and Statistics** |  | MARK: |

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| **Tick the box corresponding to the assignment number** | | | | |
| 1 | 2 | 3 | 4 | 5 |

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| StudentLast Name | Martin |
| Student First Name | Andrew |
| Student ID | 1704466 |
| Tutorial Day and Time | Tuesday 1pm |

**WARNING**

Remember to sign the plagiarism declaration at the bottom of the page. *If this is not signed, a mark of 0 will be recorded for this assignment.*

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**Plagiarism:** using another person’s ideas, designs, words or works without appropriate acknowledgement.

**Collusion:** another person assisting in the production of an assessment submission without the express requirement, or consent or knowledge of the assessor.

**NB: In this course you are encouraged to work with other students but the work you submit must be your own. This means you must understand it and be able to explain it if required.**

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| I declare that all material in this assessment is my own work except where there is clear acknowledgement and reference to the work of others. I have read the University Policy Statement on Plagiarism, Collusion and Related Forms of Cheating (http://www.adelaide.edu.au/policies/?230).  I give permission for my assessment work to be reproduced and submitted to other academic staff for the purposes of assessment and to be copied, submitted and retained in a form suitable for electronic checking of plagiarism.    24/4  Signed………………………………………………. Date …………………………………………… |

2.a   
 T is the time it takes (in hours) to prepare all the meat pies sold at the match.   
 It takes 2 hours to prepare the pies, and 6 minutes to assemble each pie.

Since Y is the number of pies per match, it takes hours or hours make each pie

From this:

b.

First finding the expectation and variance of T will make this problem much simpler:

Chebyshev’s inequality can solve this:

The lower bound is

3.a

As this PMF only has support on the positive integers, 0 is omitted, and it is considered a discrete case. Conditions for a PMF to be valid:

(1)  
(2)

The PMF is given as .  
 **,** so must be true, for (2) to hold.

For (1) to hold:

I.e.

So assuming x does in fact go to infinity, is the only solution, and the valid PMF is .b.

The moment generating function is

the sum converges

The interval is defined when i.e.

So this is defined for (although it is defined for all negatives)

c.

Since the MGF is

And:

4.

a.

As X is the amount of time a particular individual has the virus. And they have the virus for before becoming infectious, and then they recover from the virus at rate . This would make X an Erlang distribution as there are multiple exponential events with common rate

I.e.

b.

This question is ambiguous; assume that the rate is in days.

Using integration by parts:

c.

.

This problem can be considered as two independent events occurring. Let X be the time until someone is infectious, and Y be the time until they recover after becoming infectious  
 I.e. and or simpler -   
 The exponential distribution has pdf

So the probability of the person becoming infectious in less than one day, and then recovering in less than one day can be found:  
   
 Since they are independent, it can be written as:

But

So