Simulation Course Assignment

Due: Lecture 12pm on 4/04/2018

Note: This assignment will account for 10% of the total mark for ST2006 (20% of this module). Completed assignments should be submitted at the end of the lecture on 4/04/18. Extensions or late submissions will only be considered at the request of your College Tutor in exceptional circumstances.

Question 1. In Slides 6 (Acceptance-Rejection Extension, page 10-13) I demonstrated sampling from a Normal distribution given we could simulate from an Exponential distribution with rate parameter $\lambda = 1$ and claimed this was the best parameter value to use. Prove that the acceptance rate in this instance is maximized at $\lambda = 1$.

5 marks

Question 2. Given a stream $u_1, u_2, \ldots$ of pseudo-random numbers in the interval $[0, 1]$ is available, describe any process for how we may use this to generate values from a Beta(3, 2), i.e., $f(x) = 12x^2(1 - x)$ and $F(x) = 4x^3 - 3x^4$ for $0 \leq x \leq 1$.

5 marks

Question 3. Simulate the dump truck example from slides 8 using the distribution of loading time, weighing time and travel time as described there. Your simulation should run for 1000 time units. In particular your answer should include:

- The event logic (via a flow chart) for each of the three event notices.
- Commented R-script for performing the simulation (email to me by the deadline).
- A screen snapshot of your R console reporting:
  - The number of completed deliveries within the time of the simulation.
  - The total amount of time in which loaders were being used (if both in use then this counts double time).
  - The total amount of time in which the scales were in use.

15 marks