University of the Witwatersrand, Johannesburg
School of Electrical and Information Engineering
ELEN7015 Teletraffic Engineering

Tutorial Sheet 2: Erlang C and Engset Distributions

Exercise 1:

A way of generating random numbers, say 10 000, of them with an exponential PDF is the following

```
n=10000;
a=rand(1,n);
z=-log(a);
```

Generate these random numbers and examine the probability density, mean, standard deviation, maximum and minimum. Repeat and observe the results.

Hint: Extend this script, save and run.

Exercise 2: Write a function to calculate the Erlang C state probabilities and the blocking probability if the queue is finite. Pay attention to programmming to obtain compact efficient code.

Exercise 3: An engineer is dimensioning a special resource peripheral for an IN platform. This must be designed for 7 calls per second and an average holding time of 20 s. What number of voice processor units is required to give a blocking probability of 0.005 or less without queueing calls?

A proposal is made to establish whether the number of voice processors could be reduced if calls are queued. (Assume that the switch software can manage a queue.) A target has been set of an average time in the queue less than 10 seconds.

Exercise 4: A call centre has 20 agents. The average holding time for service calls is 500 seconds. The center management wishes to set an objective of average time waiting in the queue not to exceed 5 minutes. What is the maximum number of calls per hour that the centre can handle.

Exercise 5:

Write a function to calculate the Engset state probabilities and the blocking probability if the queue is finite.

Hint: Find out what the function `bincoeff` does.

Exercise 6: The delay probability for the Erlang C distribution is given in equation 1.32. The ratio A/N is a measure of the demand in relation to the capacity of the switching system. For values of $N = 5,\ 10,\ 20,\ 40$, obtain graphs of the variation of delay with A/N.
