

5th Academic Group Literacy (Topics Lecture)

Report Assignment (by Tanabe)

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April 20, 2018

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Firm Deadline: April 27 (Fri), 17:00

Q1

In average, 50 customers arrive at an ATM(Cash dispenser) per 1 hour and are waiting in the queue. Calculate the average waiting time (the average queueing delay) of a customer [**min**], from the arrival at the waiting queue to the start of using the ATM. (5 points)

Hint: The queueing system where the arrival rate (number of customers' arrival per unit time) is λ , average waiting time is W and the average number of waiting customers is L , follows the Little's law (1). Be careful of unit conversion.

$$L = \lambda W \quad (1)$$

Q2

A telephone exchange has 5 telephone lines and can accommodate up to 5 telephone calls. In average, 120 users make call requests per 1 hour and the average holding time (talking time) is 1 [min]. A call request which arrives at the telephone exchange is accommodated if there is an available line. Otherwise, the call request is not accommodated and blocked. Calculate the probability of a call to be blocked (call-blocking rate) by rounding off to the 3rd decimal place. (5 points)

Hint: When the users' arrival rate is λ and the average holding time is h , the traffic intensity (the average number of lines in use) a can be calculated as $a = \lambda h$. Then, the call-blocking rate of a telephone exchange with s lines, B can be calculated by the Erlang B formula below:

$$B = \frac{\frac{a^s}{s!}}{\sum_{i=0}^s \frac{a^i}{i!}} \quad (2)$$