

Tutorial 8
November 4/5, 2010

1. Type A, B, and C items are placed in a common buffer, each type arriving as part of an independent Poisson process with average arrival rates, respectively, of a , b , and c items per minute. For the first four parts of this problem, assume the buffer is discharged immediately whenever it contains a total of ten items.
 - (a) What is the probability that, of the first ten items to arrive at the buffer, only the first and one other are type A?
 - (b) What is the probability that any particular discharge of the buffer contains five times as many type A items as type B items?
 - (c) Determine the PDF, expectation, and variance for the total time between consecutive discharges of the buffer.
 - (d) Determine the probability that exactly two of each of the three item types arrive at the buffer input during any particular five minute interval.

2. A store opens at $t = 0$ and *potential* customers arrive in a Poisson manner at an average arrival rate of λ potential customers per hour. As long as the store is open, and independently of all other events, each particular potential customer becomes an *actual* customer with probability p . The store closes as soon as ten actual customers have arrived.
 - (a) What is the probability that exactly three of the first five potential customers become actual customers?
 - (b) What is the probability that the fifth potential customer to arrive becomes the third actual customer?
 - (c) What is the PDF and expected value for L , the duration of the interval from store opening to store closing?
 - (d) Given only that exactly three of the first five potential customers became actual customers, what is the conditional expected value of the *total* time the store is open?
 - (e) Considering only customers arriving between $t = 0$ and the closing of the store, what is the probability that no two *actual* customers arrive within τ time units of each other?

3. Problem 6.24, page 335 in text.

Consider a Poisson process with parameter λ , and an independent random variable T , which is exponential with parameter ν . Find the PMF of the number of Poisson arrivals during the time interval $[0, T]$.

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