Chapter 1

1) Consider an on-line registration system (e.g., course registration at a university, or membership registration in a conference).

1.a) List the main components of the system and its transactions.
1.b) How would you define the state and events of each component of the registration system?
1.c) Which performance measures might be of interest to registrants?
1.d) Which performance measures might be of interest to the system administrator?
1.e) What data would you collect?

Answers:

1.a) Main components: the arrival stream of registrants, the queue of registrants, and registration processing. Transactions are registrants.

1.b) Arrival stream: state is residual time to next arrival; events are registrant arrivals. Queue: state is number of registrants in queue; events are registrants joining the queue, moving on in the queue, and leaving the queue. Registration: state is residual processing time of current registrant; events are processing inauguration and completion of registrants.

1.c) Registrants are interested in their time through the registration system.

1.d) The system administrator is interested in system utilization and the throughput that is the number of completed registrations per unit time.

1.e) Registrant arrival and service times and actual customer waiting times for comparisons with any improved values.

2) The First New Brunswick Savings (FNBS) bank has a branch office with a number of tellers serving customers in the lobby, a teller serving the drive-in line and a number of service managers serving customers with special requests. The lobby, drive-in and service managers, have each a separate single queue. Customers may join either of the queues (the lobby queue, the drive-in queue, or the service managers' queue). FNBS is interested in performance evaluation of their customer service operations.

2.a) What are the random components in the system and their parameters?
2.b) What are the measures you would recommend FNBS to consider?

2.c) What would you collect data on and why?

Answers:

2.a) Random components: arrival stream, mix of service types and service times. Parameters are the parameters of arrival distribution, service distribution and mix distribution.

2.b) Customer waiting times and teller utilizations.

2.c) Customer inter-arrival times, mix probabilities, and customer service times by service type, and actual customer waiting times for comparisons with any improved values.

3) Consider the production/inventory system of Section 1.7. Suppose the system produces and stores multiple products.

3.a) List the main components of the system and its transactions as depicted in Figure 1.1.
3.b) What are the transactions and events of the system, in view of Figure 1.1?
3.c) Which performance measures might be of interest to customers, and which to owners?
3.d) What would you collect data on and why?

Answers:

3.a) Main components: batch processing, failure arrivals and repairs, warehouse, and demand arrivals.

3.b) Transactions: finished product batches, failures, and customer demands. Event: batch processing beginning and end, batch processing blocking and unblocking, failure arrival and repair, demand arrival and departure, and warehouse reordering and unblocking of processing.

3.c) Customers are interested in what portion of their order is satisfied. Owners are interested in reducing inventories and in the mean time satisfying the customer orders as much as possible.

3.d) Customer inter arrival times, demand quantities, batch processing times, time to a failure, repair times, and percentage of customers with fully satisfied demands as well as quantity of unfilled demand given that a customer's demand is not filled completely, for comparison purposes (if and when needed).