SYSTEM SIMULATION AND MODELLING

LECTURE 3

Section C

TOPIC COVERED: Queuing Notation, Long Run Measures of performance of Queuing Systems

SIMULATION OF A SINGLE SERVER QUEUEING

- Consider a single server queueing system for which the interarrival times *A*1, *A*2, ... Are independent and identically distributed (IID) random variable.
- **“Identically distributed” means that the interarrival times have the same probability distribution.**
- A customer who arrives and finds the server idle enters service immediately and the service times *S*1, *S*2, ... of the successive customers are IID random variables that are independent of the interarrival times.
- A single server queueing system is shown in Fig.

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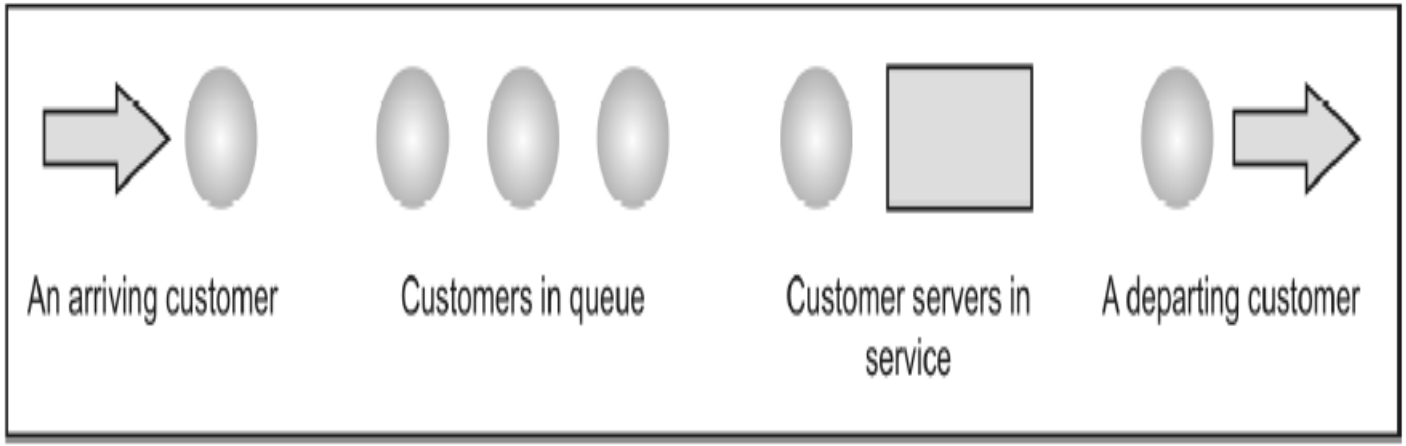

- A customer who arrives and find the server busy joins the end of a single queue.
- Upon completing service for a customer, the server chooses a customer from the queue (if any) in a first in, first out (FIFO) manner.
- The simulation will begin in the “empty and idle” state, i.e., no customers are present and the server is idle. At time 0, we will begin waiting for the arrival of the first customer, which will occur after the first interarrival time, $A1$, rather than at time 0

QUEUING SYSTEM NOMENCLATURE

- **Kendall Notations**
- a/b/c/d/e/f (Kendall Lee Notations). A brief description of each attributes is presented below.
- *a* represents the interarrival time distribution, represented by appropriate statistical distribution
- for a Markov process, interarrival time follows exponential distributions.
- *b* represents the service time distribution; represented by appropriate statistical distribution. For a Markov process, service time follows exponential distribution.
- *c* represents the number of parallel servers, defined as the number of identical servers available for service.

- *d* represents queue discipline, defined as the rule used to manage the queue.
- *e* represents system capacity, defined as the sum of queue capacity and the number of servers. The system capacity indicates the maximum number of entities that can reside simultaneously in the system.
- *f* represents the size of the calling population.