**OM 305**

**Spring 2023**

**Quiz 1**

**Waiting Lines Class Notes**

**as of 1/28/23**

**1. Operating characteristics:** average values for characteristics that describe the performance of a waiting line system.

**2. Queue:** a waiting line system that consists of arrival, servers and waiting line structure.

**3. Calling population:** the source of customers. It can be infinite or finite.

**4. Arrival rate:** the frequency at which customers arrive at a waiting line according to a probability distribution. It is most frequently described by a Poisson distribution.

**5. Poisson arrival rate:** exponential time between arrivals.

**6. λ:** is the symbol for the arrival rate.

**7. λ<μ:** customers must be served faster than they arrive, or an infinite large queue will be built.

**8.Service time:** the time required to serve a customer. It is described by the negative exponential distribution.

**9. Queue discipline:** the order in which customers are served.

**10.Channels:** the number of parallel servers for servicing customers.

**11. Phases:** the number of servers in sequence a customer must go through.

**12. A steady state:** it is a constant, average value for performance characteristics that the system will attain after a certain time.

**13. Cost of quality:** as the lever or service improves, the cost-of-service increases. Better service requires more servers.

**14. The Basic Single Server model:** Poisson arrival rate, Exponential service times, FCFS queue discipline, Infinite queue length ,Infinite Calling population.

**15. μ:** mean service rate

**16. Constant service time:** occurs with automation.

**17. Utilization rate (ρ):** the probability the server is busy and the customer must wait.

**18. Balking:** when customers do not join the queue because it is too long.

**19. Reneging:** when customers in queue give up and leave the queue.

**20. Little’s Law:** A fundamental law that relates the number in a waiting line system to the arrival rate and waiting time of customers.

**21.Operating characteristics:** queue length, number of customers in system, waiting time in line, total time in system, utilization rate

**22. System’s Structure:** waiting and serving phases.

**23. Calculations for Operating Characteristics of Single-channel:** Single phase system: probability of zero customers in the system, average utilization rate, average number of customers in the system, average number of customers in line, average time spent in the system, average waiting time in line.

**24. First Law of Service:** Satisfaction = Expectations -Actual Experience

**25. Second Law of Service**: it is hard to play catch-up ball.

**26. Queue configuration:** refers to the structure of the queue, i.e., multiple servers, single queue, or multiple server, multiple queue.

**27. Arrival patterns:** describes the time between customer arrivals.

**28. Virtual queue:** a computer managed queue; allows restaurants located in malls, for instance, to provide customers with pagers (or phone apps) allowing the restaurant to track customers in a virtual queue while allowing them to walk around and shop while waiting for a table.

**29. Psychology of waiting:** is as important as the mathematics of waiting.

**30. Jockeying:** customers switch queues

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