

Self Assessment : Week 12

1. How would you best describe Operations Management?

- A. Direction and control of process that transform inputs into finished goods and service
- B. How to make operating machines
- C. Scheduling of workers on the manufacturing floor
- D. Deciding what to make

Ans: A EXPLANATION :- B, C & D are subsets of A & thus A is most appropriate.

2. Which is not a question typically concerned with Operations Management?

- A. What benefits package should we offer our employees?
- B. What types of queues should we employ?
- C. How much capacity do we need?
- D. What is the critical path of this project?

Ans : A EXPLANATION :- Benefits package is not a concern for operations Management.

3. Knowledge of Operations Management is essential to most of the business fields?

- A. True
- B. False

Ans. A EXPLANATION :- YES, essential across most business fields.

4. In Queueing Theory what two rates do we try to model?

- A. Exit Rate and Queue Length
- B. Arrival Rate and Exit Rate
- C. Payment Rate and Service Rate
- D. Service Rate and Arrival Rate

Ans : D EXPLANATION :- Service Rate (μ) & Arrival Rate (λ) } \rightarrow everything is dependent on these two.

Use the following for Questions 5-7:

The manager of a grocery store in Decatur currently provides special service to people who still use checks to pay for food. They have a separate pay/bag line for people who insist on waiting for a dollar total to pull out their checkbook and start writing. On average, 30 customers per hour arrive at the checking pay/bag line and they can be modeled with a Poisson distribution. The clerk at this line can handle an average rate of 35 customers per hour and their service can be modeled with exponential distribution.

5. What are the queue metrics of this system?

- a. Utilization = .86, Lq = 6 customers, Wq = 10.29 min, Ls = 5.14 customers, Ws = 12 min
- b. Utilization = .86, Lq = 5.14 customers, Wq = 17 min, Ls = 6 customers, Ws = 20 min
- c. Utilization = .86, Lq = 6 customers, Wq = 20 min, Ls = 5.14 customers, Ws = 17 min
- d. Utilization = .86, Lq = 5.14 customers, Wq = 10.29 min, Ls = 6 customers, Ws = 12 min

Ans : D

$$\mu = 35/\text{hr} \text{ (Service Rate)} \quad | \quad \lambda = 30/\text{hr.} \text{ (arrival Rate)}$$

$$\rho = \frac{\lambda}{\mu} = \frac{30}{35} = 0.86$$

$$L_s = \frac{\lambda}{\mu - \lambda} = \frac{30}{35 - 30} = 6 \quad | \quad W_s = \frac{1}{\mu - \lambda} = \frac{1}{35 - 30} = 0.2 \text{ hr.} = 12 \text{ min.}$$

$$L_q = \frac{\lambda^2}{\mu(\mu - \lambda)} = \frac{30^2}{35 \times 5} = 5.14 \quad | \quad W_q = \frac{\lambda}{\mu(\mu - \lambda)} = \frac{30}{35 \times 5} = 0.17 \text{ hr.} \approx 10 \text{ min.}$$

6. What service rate would be required to have customers average only 8 minutes in the system?

- a. 40.5
- b. 36.5
- c. 37.5
- d. 30.5

Ans : C

$$W_s = 8 \text{ min.} = 8/60$$

$$W_s = \frac{1}{\mu - \lambda} \Rightarrow \frac{8}{60} = \frac{1}{\mu - 30}$$

$$\Rightarrow \mu = 37.5/\text{hr.}$$

7. For the service rate in question 6, what is the probability of having more than four check writers in the system?

- a. 67%
- b. 75%
- c. 33%
- d. 25%

Ans : C

$$\rho = \frac{\lambda}{\mu} \quad \text{Also, } P_n = \left(1 - \frac{\lambda}{\mu}\right) \left(\frac{\lambda}{\mu}\right)^n$$

$$\text{Prob. (more than 4 cheque writers)}$$

$$= 1 - (P_0 + P_1 + P_2 + P_3 + P_4)$$

$$= 1 - \left[(1 - \rho) \rho^0 + (1 - \rho) \rho^1 + \dots + (1 - \rho) \rho^4 \right]$$

$$= 1 - [1 - \rho^5] = \rho^5 = \left(\frac{30}{37.5}\right)^5 = 0.3277 \approx 33\%$$

Use the following for Questions 8-10:

The new-accounts officer at the Buzz Bank enrolls all new customers in checking accounts. During the 3 week period in August encompassing the beginning of the new school year at GT, the bank opens a lot of new accounts for students. The bank estimates the arrival during this period will be Poisson distributed with an average of four students per hour. The service time is exponentially distributed with an average of 12 minutes per student to setup a new checking account. The bank manager doesn't want a customer to wait more than 50 minutes to be served. The bank wants to determine the operating characteristics for the system and determine if the current officer is sufficient to handle the increased traffic.

8. What is the average time spent in the system?

- a. 30 min
- b. 40 min
- c. 50 min
- d. 60 min

Ans : D

$$\lambda = 4 \text{ / hr.} \quad \mu = 5 \text{ / hr.}$$
$$W_s = \frac{1}{\mu - \lambda} = \frac{1}{5 - 4} = 1 \text{ hr.}$$
$$= 60 \text{ min.}$$

9. What is the average number of students waiting in line?

- a. 2.2
- b. 3.2
- c. 2.4
- d. 4.4

Ans : B

$$L_q = \frac{\lambda^2}{\mu(\mu - \lambda)} = \frac{4^2}{5(5 - 4)}$$
$$= 3.2$$

10. Is 1 officer sufficient for this demand?

- a. Yes, average time in line is less than 50 min
- b. No, average time in line is more than 50 min
- c. Yes, productivity is 80%
- d. No, productivity is 80%

Ans : A

$$W_q = \frac{\lambda}{\mu(\mu - \lambda)} = \frac{4}{4(5 - 1)}$$
$$= \frac{4}{5} \text{ hr.} = 48 \text{ min.}$$
$$(< 50 \text{ min.})$$
$$\Rightarrow \text{YES}$$