# ESCUELA SUPERIOR POLITECNICA DEL LITORAL

Administración de Operaciones
Examen Final
Term. I, 2020

Question Bank 1 (worth 3 points each)

1.  What is the break-even point?
    a.  The quantity of sales that results in the maximum profit.
    b.  The quantity of sales that results in the negative profit.
    c.  The quantity of sales that results in zero profit.
    d.  None of these answer choices are correct

2.  What is a deterministic model?
    a.  A model in which all values used in the model have an associated probability.
    b.  A model in which all values used in the model are known with complete certainty.
    c.  A model in which the decision maker must determine the likelihood of states of nature.
    d.  None of the answer choices are correct.

3.  What is a parameter?
    a.  An immeasurable input quantity that is inherent in a problem.
    b.  A measurable input quantity that is determined by the solution to the problem.
    c.  An immeasurable input quantity that is determined by the solution to the problem.
    d.  A measurable input quantity that is inherent in a problem.

4.  Imagine a waiting line (queue) system at a bank where customers can be served by more than one bank teller. Once served by one of the bank tellers, the customer leaves. What kind of line structure does this describe?
    a.  Multiple-channel, single-phase
    b.  Single-channel, single-phase
    c.  Single-channel, multiple-phase
    d.  Multiple-channel, multiple-phase

5. What is a probabilistic model?
   a. A model in which all values used in the model are known with complete certainty.
   b. A model in which the values used in the model involve some chance or risk.
   c. None of these answers are correct

6. Decision variables are
   a. Controllable
   b. Uncontrollable
   c. Parameters
   d. Have values that are determined before the problem is solved.

7. Which of the following is a course of action or a strategy that may be chosen by a decision maker?
   a. Conditional Value
   b. Expected Monetary Value
   c. Alternative
   d. Utility

8. When would a coefficient of realism be used?
   a. When the probabilities associated with states of nature are known.
   b. When the state of nature that will occur is known with certainty.
   c. When the probabilities associated with states of nature are unknown
   d. None of these answer choices are correct.

9. Which is not part of the House of Quality Matrix?
   a. Trade-off Matrix
   b. Reliability Matrix
   c. Relationship Matrix
   d. Customer Requirements

10. A conditional probability is a _____ probability.
    a. Prior
    b. P-Value
    c. Posterior
    d. None of the answer choices are correct.

11. Which of the following is decision-making criteria that uses a weighted average of the best and worst possible payoffs for each alternative?
    a. Maximax Criterion
    b. Maximin Criterion
    c. Minimax Regret Criterion
    d. None of these answer choices are correct

12. Trudy is trying to decide what size facility to build. Her expected profit under different market conditions are given below. What would be her minimax regret decision?

|  | Strong Market | Fair Market | Poor Market |
|---|---|---|---|
| Large Facility | $500,000 | $100,000 | -$300,000 |
| Medium Facility | $300,000 | $130,000 | -$100,000 |
| Small Facility | $200,000 | $100,000 | -$32,000 |
| No Facility | 0 | 0 | 0 |

    a. Large Facility
    b. Medium Facility
    c. Small Facility
    d. No Facility

13. Consider the following information. What is the maximax decision?

| Factory Size | Good Market | Fair Market | Poor Market |
|---|---|---|---|
| Small | $50,000 | $20,000 | -$10,000 |
| Medium | $80,000 | $30,000 | -$20,000 |
| Large | $100,000 | $30,000 | -$40,000 |
| Very Large | $300,000 | $25,000 | -$160,000 |

    a. Build Small
    b. Build Medium
    c. Build Large
    d. Build Very Large

14. The Economic Order Quantity (EOQ) is:
    a. The amount of inventory ordered that will minimize the total inventory cost
    b. The amount of inventory ordered that will maximize the inventory space used.
    c. The amount of inventory ordered that will result in the break-even point for a firm.
    d. None of these answer choices are correct.

15. Which assumption does the Production Run Model relax?
    a. Constant and known demand over time
    b. No quantity discounts
    c. Orders are placed so that stockouts or shortages are avoided.
    d. Instantaneous inventory receipt

16. The inventory position:
    a. Includes the amount of inventory on hand.
    b. Includes the amount of inventory in any orders that have been placed but not yet received.
    c. Is related to the reorder point.
    d. All of these answer choices are correct

17. The lead time:
    a. Is used in determining the reorder point.
    b. Is the time it takes to place an order.
    c. Is used in determining the economic order quantity.
    d. All of the answer choices are correct

18. Which of the following is not an assumption of the standard EOQ model?
    a. Demand is known and constant over time.
    b. The only variable costs are the ordering costs, holding costs, and purchase cost per unit.
    c. The lead time is known and constant.
    d. The receipt of inventory is instantaneous.

19. _____ is an aggregate planning strategy that schedules production to match demand and absorbs variations in demand by adjusting the size of the workforce.
    a. Level Production
    b. Chase Demand
    c. Backordering
    d. Backlog

20. _____ is an aggregate planning strategy that produces units at a constant rate and uses inventory to absorb variations in demand.
    a. Chase Demand
    b. Backlog
    c. Backordering
    d. Level Production

21. Bonnie is trying to decide which equipment to purchase for her company and she is unsure if the market will be favorable or unfavorable. Her expected profits from purchasing each equipment under each market condition is given in the table below. Under the assumption that Bonnie is **pessimistic** and given the provided information, which equipment should she purchase?

| Equipment | Favorable Market ($2) | Unfavorable Market ($) |
|-----------|----------------------|------------------------|
| SuperEquip | 400,000 | -100,000 |
| MaxiMotor | 150,000 | -200,000 |
| AmazeMax | 125,000 | 18,000 |

    a. SuperEquip
    b. MaxiMotor
    c. AmazeMax

22. Consider the following LP model:
$$Min\ Z = 5X + 3Y$$
$$s.t.$$
$$10X + 6Y \geq 14$$
$$X, Y \geq 0$$

What problem does this model have?
    a. Multiple optimal solutions.
    b. Infeasibility
    c. Unboundedness
    d. There is no problem

Question Bank 2 (worth 5 points each)

23. Rachel makes pillowcases that she sells at a fair. These pillow cases have a variable cost of $5 each and she sells them for $20. The cost of her booth at the fair is $150. How many pillowcases must she sell to break even? Put only the number in the box below.

24. Consider the following LP problem:
$$\text{Max } Z = 5X + 3Y$$
$$\text{st.}$$
$$X+Y <= 7$$
$$X,Y >= 0$$
What is the optimal value of X?

25. Consider the following LP problem:
$$\text{Max } Z = 5X + 3Y$$
$$\text{st.}$$
$$X+Y <= 7$$
$$X,Y >= 0$$
What is the optimal value of Y?

26. Liam has found that the annual demand for pens is 80,000 pens. He estimates that it costs $8 every time that an order is placed. Furthermore, he estimates that the cost of carrying one pen in inventory for a year is $0.0128. Assume that demand is constant throughout the year. Assuming that he orders the EOQ and that all assumptions relevant to the EOQ model hold, what would the average inventory be? Do not round any numbers when calculating and put only the number in the answer box.

27. Consider the following LP problem:
$$\text{Max } Z = 5X + 3Y$$
$$\text{st.}$$
$$X+Y <= 7$$
$$X,Y >= 0$$
What is the shadow price associated with the constraint?

28. Kelly sells shelves in her store. She knows that the unit cost of shelves is $20 and that the carrying cost is 10% of the unit cost of the shelves. It costs her $100 to receive an order of shelves. She receives 200 shelves each time she places an order. Assuming that she receives the EOQ amount, what is the annual demand for shelves? Write only the number in the box.

29. Consider the following LP problem:
$$\text{Max } Z = 5X + 3Y$$
$$\text{st.}$$
$$X+Y <= 7$$
$$X,Y >= 0$$

What is the reduced cost associated with Y?

30. Kelly sells shelves in her store. She has the option to get a quantity discount on the price of shelves if she purchases more than 250 shelves. If she purchases less than 250 shelves, the unit cost is $20. If she purchases 250 shelves or more, the cost per unit is $18. The carrying cost is 10% of the unit cost of the shelves. It costs her $100 to receive an order of shelves. Her annual demand for shelves is 500. How many shelves should she purchase each time she places an order? Write only the number in the box below.

31. Consider the following project and the associated activities:

| Activity | Activity Time | Predecessor |
|---|---|---|
| A | 3 | - |
| B | 2 | A |
| C | 5 | A |
| D | 2 | B |
| E | 1 | C |

Assuming that you start the project in week 0, in what week will the project be completed?

32. What is the reliability of a system that has 3 parts in the system each with a reliability of 0.85 and one backup part with a reliability of 0.7? Round to two decimal places.

33. Michelle is thinking about investing some money. The following payoff table gives the profits that would be realized during the next year for each of three investment alternatives that she may be considering. What is the maximum amount that should be paid for a perfect forecast of the economy?

| Decision Alternative | Good Economy | Poor Economy |
|---|---|---|
| Stock Market | $90,000 | -$30,000 |
| Bonds | $20,000 | $15,000 |
| CDs | $18,000 | $18,000 |
| Probability | 0.5 | 0.5 |

34. As a regional sales manager, Nora Burke travels frequently and relies on her cell phone to keep up to date with clients. She has tried three different service providers, Airway, Bellular, and CyCom, with varying degrees of success. The number of failures in a typical eight-hour day and the average time to regain service are shown below. Nora's contract is up for renewal. What is the service availability of the cellular company with the best service availability? Round to two decimal places.

| Cellular Co. | Number of Failures | Time to Regain Service |
|---|---|---|
| Airway | 10 | 2 |
| Bellular | 8 | 4 |
| Cycom | 3 | 10 |

35. Consider the following LP problem:

$$\text{Max } Z = 5X + 3Y$$
$$\text{st.}$$
$$X+Y <= 7$$
$$X,Y >= 0$$

What is the reduced cost associated with X?

The following question is worth 10 points.

36. Consider the following project and the associated activities:

| Activity | Activity Time | Predecessor |
|---|---|---|
| A | 3 | - |
| B | 2 | A |
| C | 5 | A |
| D | 2 | B |
| E | 1 | C |

If you are asked to make a linear programming project to crash this project to 7 weeks, what additional information would you need? All information must be listed for full points. Points will be deducted for providing information that is not needed.