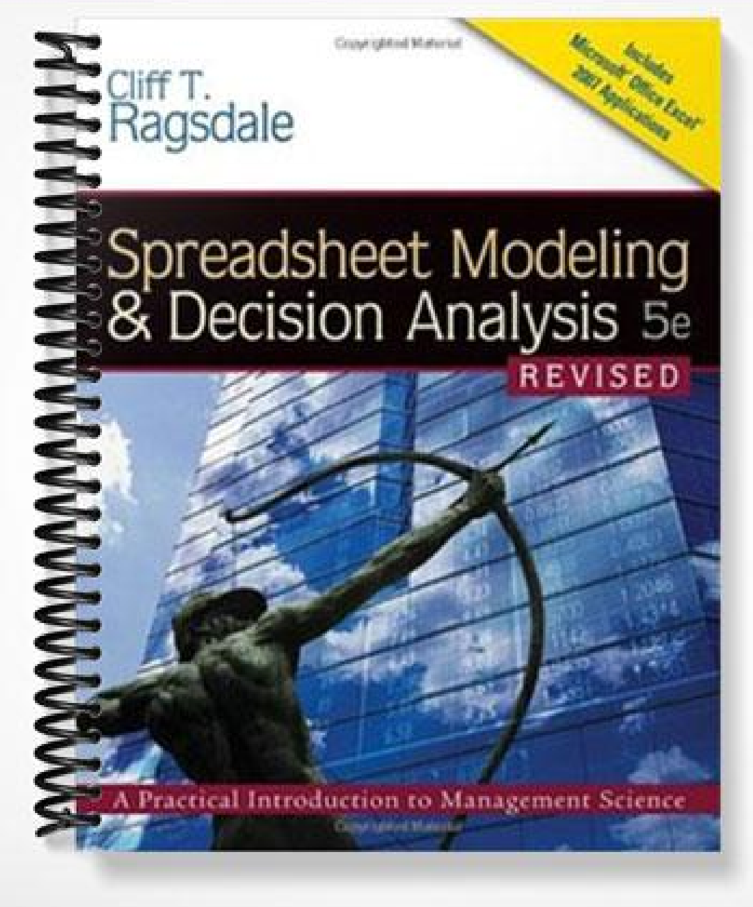
TEST BANK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Chapter 2--Introduction to Optimization and Linear Programming

Student: ____

1. What most motivates a business to be concerned with efficient use of their resources?

   A. Resources are limited and valuable.
   B. Efficient resource use increases business costs.
   C. Efficient resources use means more free time.
   D. Inefficient resource use means hiring more workers.

2. Which of the following fields of management science finds the optimal method of using resources to achieve the objectives of a business?

   A. Simulation
   B. Regression
   C. Mathematical programming
   D. Discriminant analysis

3. Mathematical programming is referred to as

   A. optimization.
   B. satisficing.
   C. approximation.
   D. simulation.

4. What are the three common elements of an optimization problem?

   A. objectives, resources, goals.
   B. decisions, constraints, an objective.
   C. decision variables, profit levels, costs.
   D. decisions, resource requirements, a profit function.

5. A mathematical programming application employed by a shipping company is most likely

   A. a product mix problem.
   B. a manufacturing problem.
   C. a routing and logistics problem.
   D. a financial planning problem.

6. What is the goal in optimization?

   A. Find the best decision variable values that satisfy all constraints.
   B. Find the values of the decision variables that use all available resources.
   C. Find the values of the decision variables that satisfy all constraints.
   D. None of the above.

7. A set of values for the decision variables that satisfy all the constraints and yields the highest objective function value is

   A. a feasible solution.
   B. an optimal solution.
   C. a corner point solution.
   D. both a and c.

8. A common objective in the product mix problem is

   A. maximizing cost.
   B. maximizing profit.
   C. minimizing production time.
   D. maximizing production volume.

9. A common objective when manufacturing printed circuit boards is

   A. maximizing the number of holes drilled.
   B. maximizing the number of drill bit changes.
   C. minimizing the number of holes drilled.
   D. minimizing the total distance the drill bit must be moved.

10. Limited resources are modeled in optimization problems as

    A. an objective function.
    B. constraints.
    C. decision variables.
    D. alternatives.

11. Retail companies try to find

    A. the least costly method of transferring goods from warehouses to stores.
    B. the most costly method of transferring goods from warehouses to stores.
    C. the largest number of goods to transfer from warehouses to stores.
    D. the least profitable method of transferring goods from warehouses to stores.

12. Most individuals manage their individual retirement accounts (IRAs) so they

    A. maximize the amount of money they withdraw.
    B. minimize the amount of taxes they must pay.
    C. retire with a minimum amount of money.
    D. leave all their money to the government.

13. The number of units to ship from Chicago to Memphis is an example of a(n)

A. decision.
B. constraint.
C. objective.
D. parameter.

14. A manager has only 200 tons of plastic for his company. This is an example of a(n)

A. decision.
B. constraint.
C. objective.
D. parameter.

15. The desire to maximize profits is an example of a(n)

A. decision.
B. constraint.
C. objective.
D. parameter.

16. The symbols X_1, Z1, Dog are all examples of

A. decision variables.
B. constraints.
C. objectives.
D. parameters.

17. A greater than or equal to constraint can be expressed as

A. $f(X_1, X_2, \ldots, X_n)$ £ b.
B. $f(X_1, X_2, \ldots, X_n)$ ³ b.
C. $f(X_1, X_2, \ldots, X_n) = b$.
D. $f(X_1, X_2, \ldots, X_n)$ ¹ b.

18. A production optimization problem has 4 decision variables and resource b_1 limits how many of the 4 products can be produced. Which of the following constraints reflects this fact?

A. $f(X_1, X_2, X_3, X_4)$ £ b_1
B. $f(X_1, X_2, X_3, X_4)$ ³ b_1
C. $f(X_1, X_2, X_3, X_4) = b_1$
D. $f(X_1, X_2, X_3, X_4)$ ¹ b_1

19. A production optimization problem has 4 decision variables and a requirement that at least b_1 units of material b_1 are consumed. Which of the following constraints reflects this fact?

A. $f(X_1, X_2, X_3, X_4)$ £ b_1
B. $f(X_1, X_2, X_3, X_4)$ ³ b_1
C. $f(X_1, X_2, X_3, X_4) = b_1$
D. $f(X_1, X_2, X_3, X_4)$ ¹ b_1

20. Which of the following is the general format of an objective function?

A. $f(X_1, X_2, ... , X_n)$ £ b
B. $f(X_1, X_2, ... , X_n)$ ³ b
C. $f(X_1, X_2, ... , X_n) = b$
D. $f(X_1, X_2, ... , X_n)$

21. Linear programming problems have

A. linear objective functions, non-linear constraints.
B. non-linear objective functions, non-linear constraints.
C. non-linear objective functions, linear constraints.
D. linear objective functions, linear constraints.

22. The first step in formulating a linear programming problem is

A. Identify any upper or lower bounds on the decision variables.
B. State the constraints as linear combinations of the decision variables.
C. Understand the problem.
D. Identify the decision variables.
E. State the objective function as a linear combination of the decision variables.

23. The second step in formulating a linear programming problem is

A. Identify any upper or lower bounds on the decision variables.
B. State the constraints as linear combinations of the decision variables.
C. Understand the problem.
D. Identify the decision variables.
E. State the objective function as a linear combination of the decision variables.

24. The third step in formulating a linear programming problem is

A. Identify any upper or lower bounds on the decision variables.
B. State the constraints as linear combinations of the decision variables.
C. Understand the problem.
D. Identify the decision variables.
E. State the objective function as a linear combination of the decision variables.

25. The following linear programming problem has been written to plan the production of two products. The company wants to maximize its profits.

X_1 = number of product 1 produced in each batch
X_2 = number of product 2 produced in each batch

MAX:	$150 X_1 + 250 X_2$
Subject to:	$2 X_1 + 5 X_2$ £ 200
	$3 X_1 + 7 X_2$ £ 175
	X_1, X_2 ³ 0

How much profit is earned per each unit of product 2 produced?

A. 150
B. 175
C. 200
D. 250

26. The following linear programming problem has been written to plan the production of two products. The company wants to maximize its profits.

X_1 = number of product 1 produced in each batch
X_2 = number of product 2 produced in each batch

MAX:	$150 X_1 + 250 X_2$
Subject to:	$2 X_1 + 5 X_2$ £ 200 - resource 1
	$3 X_1 + 7 X_2$ £ 175 - resource 2
	X_1, X_2 ³ 0

How many units of resource 1 are consumed by each unit of product 1 produced?

A. 1
B. 2
C. 3
D. 5

27. The following linear programming problem has been written to plan the production of two products. The company wants to maximize its profits.

X_1 = number of product 1 produced in each batch
X_2 = number of product 2 produced in each batch

MAX:	$150 X_1 + 250 X_2$
Subject to:	$2 X_1 + 5 X_2$ £ 200
	$3 X_1 + 7 X_2$ £ 175
	X_1, X_2 ³ 0

How much profit is earned if the company produces 10 units of product 1 and 5 units of product 2?

A. 750
B. 2500
C. 2750
D. 3250

28. A company uses 4 pounds of resource 1 to make each unit of X_1 and 3 pounds of resource 1 to make each unit of X_2. There are only 150 pounds of resource 1 available. Which of the following constraints reflects the relationship between X_1, X_2 and resource 1?

A. $4 X_1 + 3 X_2$ ³ 150
B. $4 X_1 + 3 X_2$ £ 150
C. $4 X_1 + 3 X_2 = 150$
D. $4 X_1$ £ 150

29. A diet is being developed which must contain at least 100 mg of vitamin C. Two fruits are used in this diet. Bananas contain 30 mg of vitamin C and Apples contain 20 mg of vitamin C. The diet must contain at least 100 mg of vitamin C. Which of the following constraints reflects the relationship between Bananas, Apples and vitamin C?

A. 20 A + 30 B ³ 100
B. 20 A + 30 B £ 100
C. 20 A + 30 B = 100
D. 20 A = 100

30. The constraint for resource 1 is $5 X_1 + 4 X_2$ £ 200. If $X_1 = 20$, what it the maximum value for X_2?

A. 20
B. 25
C. 40
D. 50

31. The constraint for resource 1 is $5 X_1 + 4 X_2$ ³ 200. If $X_2 = 20$, what it the minimum value for X_1?

A. 20
B. 24
C. 40
D. 50

32. The constraint for resource 1 is $5 X_1 + 4 X_2$ £ 200. If $X_1 = 20$ and $X_2 = 5$, how much of resource 1 is unused?

A. 0
B. 80
C. 100
D. 200

33. The constraint for resource 1 is $5 X_1 + 4 X_2$ ³ 200. If $X_1 = 40$ and $X_2 = 20$, how many additional units, if any, of resource 1 are employed above the minimum of 200?

A. 0
B. 20
C. 40
D. 80

34. The objective function for a LP model is $3 X_1 + 2 X_2$. If $X_1 = 20$ and $X_2 = 30$, what is the value of the objective function?

A. 0
B. 50
C. 60
D. 120

35. A company makes two products, X_1 and X_2. They require at least 20 of each be produced. Which set of lower bound constraints reflect this requirement?

A. X_1 ³ 20, X_2 ³ 20
B. $X_1 + X_2$ ³ 20
C. $X_1 + X_2$ ³ 40
D. X_1 ³ 20, X_2 ³ 20, $X_1 + X_2$ £ 40

36. Why do we study the graphical method of solving LP problems?

A. Lines are easy to draw on paper.
B. To develop an understanding of the linear programming strategy.
C. It is faster than computerized methods.
D. It provides better solutions than computerized methods.

37. The constraints of an LP model define the

A. feasible region
B. practical region
C. maximal region
D. opportunity region

38. The following diagram shows the constraints for a LP model. Assume the point (0,0) satisfies constraint (B,J) but does not satisfy constraints (D,H) or (C,I). Which set of points on this diagram defines the feasible solution space?

A. A, B, E, F, H
B. A, D, G, J
C. F, G, H, J
D. F, G, I, J

39. If constraints are added to an LP model the feasible solution space will generally

A. none of these alternatives is correct.
B. increase.
C. remain the same.
D. become infeasible.

40. Which of the following actions would expand the feasible region of an LP model?

A. Loosening the constraints.
B. Tightening the constraints.
C. Multiplying each constraint by 2.
D. Adding an additional constraint.

41. Level curves are used when solving LP models using the graphical method. To what part of the model do level curves relate?

A. constraints
B. boundaries
C. right hand sides
D. objective function

42. This graph shows the feasible region (defined by points ACDEF) and objective function level curve (BG) for a maximization problem. Which point corresponds to the optimal solution to the problem?

A. A
B. B
C. C
D. D
E. E

43. When do alternate optimal solutions occur in LP models?

A. When a constraint is parallel to a level curve.
B. When a constraint is perpendicular to a level curve.
C. When a constraint is parallel to another constraint.
D. Alternate optimal solutions indicate an infeasible condition.

44. A redundant constraint is one which

A. plays no role in determining the feasible region of the problem.
B. is parallel to the level curve.
C. is added after the problem is already formulated.
D. can only increase the objective function value.

45. When the objective function can increase without ever contacting a constraint the LP model is said to be

A. infeasible.
B. open ended.
C. multi-optimal.
D. unbounded.

46. If there is no way to simultaneously satisfy all the constraints in an LP model the problem is said to be

A. infeasible.
B. open ended.
C. multi-optimal.
D. unbounded.

47. Which of the following special conditions in an LP model represent potential errors in the mathematical formulation?

A. Alternate optimum solutions and infeasibility.
B. Redundant constraints and unbounded solutions.
C. Infeasibility and unbounded solutions.
D. Alternate optimum solutions and redundant constraints.

Chapter 2--Introduction to Optimization and Linear Programming Key

1. A

2. C

3. A

4. B

5. C

6. A

7. B

8. B

9. D

10. B

11. A

12. B

13. A

14. B

15. C

16. A

17. B

18. A

19. B

20. D

21. D

22. C

23. D

24. E

25. D

26. B

27. C

28. B

29. A

30. B

31. B

32. B

33. D

34. D

35. A

36. B

37. A

38. D

39. D

40. A

41. D

42. D

43. A

44. A

45. D

46. A

47. C