BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Bachelor of Computer Applications
Course Name – Optimization Techniques
Course Code - GEBS401
(Semester IV)

Time allotted : 1 Hrs.15 Min. **Full Marks : 60**

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question) 1 x 60=60

Choose the correct alternative from the following :

(1) A shop can make two types of sweets (A and B). They use two resources – flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 25 kg of flour and 28 kg of sugar. These sweets are sold at Rs 800 and 900 per packet respectively. Find the best product mix.

An appropriate objective function for this problem is to

a) Maximize total revenue
b) Minimize total cost
c) Maximize the total units of products produced.
d) None of these

(2) A shop can make two types of sweets (A and B). They use two resources – flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 25 kg of flour and 28 kg of sugar. These sweets are sold at Rs 800 and 900 per packet respectively. Find the best product mix.

The number of decision variables is _____

a) 1
b) 2
c) 3
d) 4

(3) A shop can make two types of sweets (A and B). They use two resources – flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 25 kg of flour and 28 kg of sugar. These sweets are sold at Rs 800 and 900 per packet respectively. Find the best product mix.

The number of constraints is _____

a) 2
b) 3
c) 4
d) 5

(4) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units.

Which of the following is the correct decision variable?

a) Amount of money invested in each scheme

b) Amount of revenue obtained from each scheme

c) Amount of risk through investment in each scheme

d) Total amount that can be obtained from the investments

(5) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units.

How many decision variables are in your formulation?

a) 1

b) 2

c) 3

d) 4

(6) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units.

How many constraints are in your formulation?

a) 2

b) 3

c) 4

d) 5

(7) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units.

How many greater than or equal to constraints are in your formulation. (To answer this question you should write your constraints such that the right hand side value is non negative)

a) 1

b) 2

c) 3

d) 4

(8) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions:

The objective function

a) Maximizes the total cost of transportation

b) Maximizes the total quantity transported

between factories and warehouses and between warehouses and retail stores

between factories and warehouses and between warehouses and retail stores.

c) Minimizes the total cost of transportation between factories and warehouses and between warehouses and retail stores.

d) Minimizes the total quantity transported between factories and warehouses and between warehouses and retail stores.

(9) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions:

The number of terms in the objective function is

a) 6
b) 8
c) 12
d) 18

(10) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions:

The number of decision variables in the formulation is

a) 8
b) 10
c) 12
d) 18

(11) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions:

The number of constraints in the formulation is

a) 6
b) 8
c) 10
d) 12

(12) A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period.

What is the correct objective function for this problem?

a) Maximize the total money available at the

b) Maximize the total money at the end of the

end of the third period

c) Maximize the total money at the end of the third period less total money paid back including interest

third period less total money borrowed

d)

Maximize the number of items sold at the end of the third period

(13) A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period.

How many decision variables are in the formulation?

a) 3
b) 6
c) 9
d) 10

(14) A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period.

How many constraints are in the formulation?

a) 6
b) 9
c) 12
d) 13

(15) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.

The objective function has _____ terms.

a) 54
b) 55
c) 56
d) 57

(16) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.

The total number of variables in the formulation is _____

a) 58
b) 57
c) 55
d) 53

(17) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.

The total number of constraints relating to the laundries is _____

a) 12
b) 14
c) 16
d) 18

(18) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.

The constraint to meet the demand of day 10 will have _____ terms.

a) 20
b) 25
c) 30
d) 35

(19) Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to
$X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0$
The objective function corresponding to the optimum solution is.....

a) 24
b) 26
c) 28
d) 30

(20) Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$3X_1 + 4X_2 \leq 12$
$5X_1 + 2X_2 \leq 20$
$X_1, X_2 \geq 0.$
The objective function corresponding to the optimum solution is _____

a) 24
b) 26
c) 30
d) 36

(21) Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$4X_1 + 5X_2 \leq 20$
$3X_1 + 2X_2 \leq 12$
$X_1 + 2X_2 \geq 3$
$X_1, X_2 \geq 0$. The number of corner points in the graphical solution is_____

a) 4
b) 5
c) 6
d) No corner point

(22) A constraint that does not affect the feasible region is a

a) non-negativity constraint
b) slack constraint
c) redundant constraint
d) standard constraint

(23) Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$3X_1 + 4X_2 \leq 16$
$5X_1 + 2X_2 \leq 12$
$X_1, X_2 \geq 0$
The corner point obtained by solving $3X_1 + 4X_2 = 16$ and $5X_1 + 2X_2 = 12$ is

a) (8/7, 22/7)
b) (7/8, 22/7)
c) (8/7, 7/22)
d) (7/8, 7/22)

(24) Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$2X_1 + 3X_2 \leq 8$
$2X_1 + 3X_2 \geq -1$
$X_1, X_2 \geq 0.$
The corner point that gives the optimum solution is

a) (0,8/3)
b) (8/3,0)
c) (0,3/8)
d) (3/8,0)

(25) Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 \leq 4$
$X_1 - X_2 \geq 0$
$X_1, X_2 \geq 0$
The objective function corresponding to the optimum solution is _____

a) 48
b) 49
c) 51
d) 52

(26) Consider the LP problem:
Minimize $5X_1 + 8X_2$
subject to
$X_1 + X_2 \leq 6$
$X_1 + X_2 \geq 2$
$X_1 - X_2 \leq 2$
$X_1 - X_2 \geq -2$
$X_1, X_2 \geq 0.$
The objective function value at optimum is _____

a) 6
b) 7
c) 8
d) 10

(27) Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic solutions is _____

a) 1
b) 4
c) 2
d) 6

(28) Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0.$
Solve by algebraic method and answer the following:
If we solve for X_1 and X_3 as basic and the other variables as non-basic, the value of X_2 is _____

a) 0
b) 1
c) 2
d) 4

(29)

Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic solutions is _____

a) 8 b) 9
c) 10 d) 11

(30)
Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic infeasible solutions is _____

a) 1 b) 2
c) 3 d) 4

(31)
Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
If we solve for X_2 and X_3 as basic and the other variables as non-basic, the value of X_3 is _____

a) 1.5 b) 1.9
c) 2.4 d) 2.5

(32)
Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The optimum solution has $X_1 =$ _____

a) 2 b) 5
c) 6 d) 8

(33) Consider a transportation problem with 3 supply points and 4 demand points. The number of variables in the formulation is

a) 3 b) 4
c) 7 d) 12

(34) In a m x n balanced transportation problem the number of allocations in a non-degenerate basic feasible solution is

a) m b) n
c) mn d) m+n-1

(35) The maximum profit for the following 3 x 3 assignment problem is

1	1	4
6	7	2
8	4	3

a) 15
b) 18
c) 19
d) 23

(36) If u_i and v_j represent the dual variables in the assignment formulation, the constraint set is given by

a) $u_i + v_j = C_{ij}$
b) $u_i + v_j \geq C_{ij}$
c) $u_i + vj \leq C_{ij}$
d) None of these

(37) Consider the following balanced TP with 2 supplies and 3 destinations. The solution is found using Minimum cost method. The cost is

5	6	3	50
7	5	8	40
30	25	35	

a) 405
b) 410
c) 415
d) 420

(38) Consider the following balanced TP with 2 supplies and 3 destinations. The solution is found using Vogel's approximation method. The cost is

5	6	3	50
7	5	8	40
30	25	35	

a) 310
b) 410
c) 315
d) 415

(39) The purpose of the transportation approach for locational analysis is to minimize

a) total costs
b) total shipping costs
c) total variable costs
d) total fixed costs

(40) Which of the following statements about the northwest corner rule is false?

a) One must exhaust the supply for each row before moving down to the next row
b) One must exhaust the demand requirements of each column before moving to the next column
c) When moving to a new row or column, one must select the cell with the lowest cost.
d) One must check that all supply and demand constraints are met.

(41) A transportation problem has a feasible solution when

a) all of the improvement indexes are positive
b) all the squares are used
c) the solution yields the lowest possible cost
d) all demand and supply constraints are satisfied

(42) The total cost of the optimal solution to a transportation problem

a) is calculated by multiplying the total supply (including any dummy values) by the
b) cannot be calculated from the information given

average cost of the cells

c) can be calculated from the original non-optimal cost, by adding the savings made at each improvement

d) can be calculated based only on the entries in the filled cells of the solution

(43) In a minimization problem, a negative improvement index in a cell indicates that the

a) solution is optimal

b) total cost will increase if units are reallocated to that cell

c) total cost will decrease if units are reallocated to that cell

d) current iteration is worse than the previous one

(44) An improvement index indicates

a) whether a method other than the stepping stone should be used

b) whether a method other that the northwest corner rule should be used

c) whether the transportation cost in the upper left-hand corner of a cell is optimal

d) how much total cost would increase or decrease if a single unit was reallocated to that cell

(45) How many feasible solutions does a 5 x 5 assignment problem have?

a) 5!

b) 4!

c) 6!

d) 3!

(46) How many variables does the formulation of 5 x 5 assignment problem have?

a) 20

b) 25

c) 30

d) 35

(47) How many constraints does a 5 x 5 assignment problem have?

a) 8

b) 10

c) 12

d) 15

(48) In a fair game the value of the game is

a) Positive

b) 0

c) Negative

d) Can't say anything

(49) In game theory, a situation in which one firm can gain only what another firm loses is called a

a) nonzero-sum game.

b) prisoners' dilemma.

c) zero-sum game.

d) cartel temptation.

(50) Which of the following is an example of a game theory strategy

a) You scratch my back and I'll scratch yours.

b) If the shoe fits, wear it.

c) Monkey see, monkey do.

d) None of these

(51) Which of the following is a zero-sum game?

a) Prisoners' dilemma

b) Chess

c) A cartel member's decision regarding whether or not to cheat

d) All of these

(52) A plan of action that considers the reactions of rivals is an example of

a) accounting liability.

b) strategic behavior.

c) accommodating behavior.

d) a. risk management.

(53) In game theory, the outcome or consequence of a strategy is referred to as the

a) payoff.

b) penalty.

c) reward.

d) end-game strategy.

(54) How many constraints does the dual of the 5 x 5 assignment problem have?

a) 15
b) 20
c) 25
d) 30

(55) The measure that compares the marginal contribution of a variable with the marginal worth of the resources it consumes is the

a) reduced cost
b) allowable increase
c) shadow price
d) allowable decrease

(56) The measure that shows the change in the optimal objective function value if a product that is not currently produced is forced to be produced is the

a) allowable decrease
b) shadow price
c) reduced cost
d) allowable increase

(57) If we wish to increase a constraint RHS value beyond the allowable increase vlue shown in the Sensitivity Report, this means

a) there will no longer be a feasible solution for the problem
b) such a change should never be made
c) the problem needs to be solve again to get a new sensitivity report
d) the shadow price in the report is still valid.

(58) The pricing out procedure allows us to

a) analyze the impact of changes in the selling price of existing product.
b) analyze simultaneous changes in parametric values.
c) analyze the impact of the introduction of a new variable.
d) analyze the impact of changes in the cost of resources.

(59) If the RHS value of a >=constraint increases, the optimal value of a maximization objective function can never

a) increase
b) stay in the same
c) decrease
d) none of these.

(60) If the RHS value of a<=constraint decreases, the optimal value of a maximization objective function can never

a) decrease
b) stay in the same
c) increase
d) none of these.