BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – BCA-2022
Course Name – Optimization Techniques
Course Code - BCAC403
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Select the correct option: The Operations Research came into existence
a) in the year 1940 b) in the year 1920
c) during World War I d) during World War II

(ii) Observe "A model in Operations Research is"
a) an approximation b) an idealization
c) an essence of reality d) all of these

(iii) Identify which of the following is not associated with an LPP.
a) Proportionality b) Uncertainty
c) Additivity d) Divisibility

(iv) Select the correct one----A constraint in an LPP restricts
a) value of objective function b) value of a decision variable
c) use of available resource d) uncertainity of optimum value

(v) Select from the following: The incorrect option about LPP is
a) all constraints must be linear relationships b) Objective function must be linear
c) All the constraints and decision variables must be of either 'less than or equal to'or greater than or equal to'type d) All decision variables must be non-negative

(vi) Identify the primary objective of parametric analysis of cost and requirement vector in linear programming?
a) To identify the effect of changes in cost coefficients and requirements on the optimal solution b) To determine the feasibility of constraints
c) To find alternative optimal solutions d) To assess the impact of changes in the objective function coefficients

(vii) Select the correct option. An example of zero-sum game is

a) Prisoners' dilemma
b) Chess
c) A cartel member's decision regarding whether or not to cheat
d) All of these

(viii) Choose the correct option. Game models are classified by the

a) size of the payoff.
b) sum of all payoffs.
c) nature of strategies employed.
d) none of these

(ix) Each player should follow the same strategy regardless of the other player's strategy is examined as

a) Constant strategy
b) Mixed strategy
c) Pure strategy
d) Dominance strategy

(x) Consider a transportation problem with 3 supply points and 4 demand points. Illustrate the number of constraints in the formulation is

a) 3
b) 6
c) 7
d) 10

(xi) Consider the following balanced TP with 2 supplies and 3 destinations. The solution is found using NWC rule. Calculate the cost.

5	6	3	50
7	5	8	40
30	25	35	

a) 570
b) 575
c) 580
d) 595

(xii) Choose the wrong one about the northwest corner rule.

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.

(xiii) Choose the correct option. 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 average cost of the cells
b) cannot be calculated from the information given
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

(xiv) Choose the correct option. The stepping-stone method

a) is an alternative to using the northwest corner rule
b) often involves tracing closed paths with a triangular shape
c) is used to evaluate the cost effectiveness of shipping goods via transportation routes not currently in the solution
d) is used to identify the relevant costs in a transportation problem

(xv) Choose the wrong options about the Assignment problem:

a) It is a transportation problem
b) The LP formulation will give binary solutions
c) When solving, the cost matrix is square
d) LP can give non integer solution sometimes

Group-B

2. **Using graphical method, determine that the following L.P.P has no solution.** (3)

$$\text{Maximize } z = 4x + 3y$$
$$\text{subject to } x + 4y \leq 3$$
$$3x + y \geq 12$$
$$x, y \geq 0$$

3. Define the following terms: (3)

(a) Pay-off matrix
(b) Zero sum game

4. 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. Illustrate the LPP. (3)

5. **Examine value of λ , the game with the following payoff matrix is strictly determinable.** (3)

		B	
A	λ	7	3
	-2	λ	-8
	-3	4	λ

6. Conclude the following terms: (3)

(a) Project

(b) Critical Path

OR

The following precedence relationships are given for a project consisting of eight activities: (3)

Activity	Immediate Predecessor(s)
A	--
B	A

C	A
D	B,C
E	C
F	D
G	E
H	F,G

Reframe a network based on the information.

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Estimate the solution of the Assignment Problem given below for minimum cost. (5)

	A	B	C	D
M1	18	26	17	11
M2	13	28	14	26
M3	38	19	18	15
M4	19	26	24	10

8. Construct the value of the game (5)

		Player B		
Player A		B1	B2	B3
	A1	50	35	55
	A2	40	45	60

9. Solve by Graphical method to calculate the following game. (5)

		Player A			
		A1	A2	A3	A4
Player B	B1	2	2	3	-2
	B2	4	3	2	6

10. Evaluate the solution of the Transportation problem. (5)

	D1	D2	D3	Supply
O1	10	7	8	45
O2	15	12	9	15
O3	7	8	12	40
Demand	25	55	20	

11. A small manufacturer making two products A and B. Two resources R1 and R2 are required to make these products. Each unit of product A requires 1 unit of R1 and 3 units of R2. Each unit of product B requires 1 unit of R1 and 2 units of R2. The manufacturer has 5 units of R1 and 12 units of R2 available. The manufacturer also makes a profit of Rs. 6 per unit of product A when sold and Rs. 5 per unit of product B when sold. (5)

Define a mathematical formulation to this linear programming problem for maximizes the profit.

12. Express the limitations of Linear Programming. (5)

OR

A small project consists of eleven activities. The details of which along with duration of days are given below: (5)

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M
Predecessor	-	A	B	A	D	E	-	G	J,H	-	A	C,K	I,L
Duration(day)	6	4	7	2	4	10	2	10	6	13	9	3	5

(i) Illustrate the network diagram.

(ii) Construct the critical path and critical activities and project duration.

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