BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.CSE-2022
Course Name – Operations Research
Course Code - DCSE-OE501B
(Semester V)

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) Identify the following situation where Operations Research techniques are not applicable

a) Resources available are unlimited
b) Objective can be defined for maximization or minimization
c) Sufficient input data is available for formulating the problem
d) Scientific methods, techniques and tools may be applied

(ii) Select the one that is not correct.

a) a model should be simple and coherent
b) a model should not take much time in its construction for any problem
c) A model representing the typical budget of business accounts is called "account model"
d) a model which has the probability of measuring observations is called "qualitative model"

(iii) Write an example of a deterministic model in Operations Research

a) Queuing model
b) Linear programming model
c) Monte Carlo simulation model
d) Game theory model

(iv) Write the purpose for using mathematical models in Operations Research

a) To express relationships between variables
b) To create artwork
c) To write poetry
d) To perform surgery

(v) Identify the following that is not associated with an LPP

a) Proportionality
b) Uncertainty
c) Additivity
d) Divisibility

(vi) 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 '≤ 'or ' ≥' type
d) All decision variables must be non-negative

(vii) Illustrate the primary objective of formulating a Linear Programming Problem

a) To maximize or minimize a linear objective function subject to linear constraints.
b) To solve complex mathematical equations
c) To analyze non-linear systems
d) To optimize quadratic functions

(viii) Choose the following which is NOT a component of a Linear Programming Problem

a) Objective function
b) Constraints
c) Non-linearity
d) Non-negativity restrictions

(ix) Write from the following that is true about a basic feasible solution

a) It is always optimal
b) It satisfies all the constraints and the number of non-zero variables is equal to the number of constraints
c) It only maximizes the objective function
d) It violates some of the constraints

(x) Write the correct statement about basic feasible solution

a) An extreme point of the feasible region
b) The midpoint of the feasible region
c) Any random point in the feasible region
d) A non-extreme point of the feasible region

(xi) Choose the correct option. A constraint that does not affect the feasible region is a

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

(xii) If the objective function is parallel to one of the constraint lines, then choose the correct option.

a) There is no solution
b) There are infinitely many solutions along the constraint line
c) The solution is at the origin
d) The solution is unbounded

(xiii) In linear programming, choose "the decision variables" are

a) The unknowns to be determined
b) The coefficients in the objective function
c) The right-hand side values of constraints
d) None of these

(xiv) Select the first step in solving an LPP using the graphical method

a) Identify the constraints
b) Plot the objective function
c) Identify the decision variables
d) None of these

(xv) Choose correct option from the following:

The Simplex method moves from one

a) Basic feasible solution to another
b) Infeasible solution to a feasible solution
c) Optimal solution to a suboptimal solution
d) None of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Consider the LP problem:
Maximize $5X_1 + 6X_2$
subject to
$X_1 + 2X_2 \leq 7$
$3X_1 + 5X_2 \leq 13$
$X_1, X_2 \geq 0$
Write this into standard form (3)

3. Explain the term operations Research (OR) and its significance in decision-making processes (3)

4. Write the dual of the following L. P. P:
Min $z = 2x_1 - 9x_2$
subject to: $x_1 + 6x_2 \leq 27$
$3x_1 + 7x_2 \leq 23$
$7x_1 - x_2 \leq 13$ and $x_1, x_2 \geq 0$ (3)

5. Explain feasible solution and basic feasible solution in Linear Programming (3)

6. Evaluate one basic feasible solution of the system of equations (3)

$$x_1 + x_2 + x_3 = 4$$

$$2x_1 + 5x_2 - 2x_3 = 8$$

OR

Evaluate one solution of the system of equation: (3)

$$x_1 + x_2 + x_3 = 8$$

$$3x_1 + 2x_2 = 18$$

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Apply simplex method to evaluate the optimal solution of the following L.P.P. (5)

$$Max\ z = 3x_1 + x_2 + 3\,x_3$$

Subject to the constraints

$2x_1 + x_2 + x_3 \leq 2$

$x_1 + 2x_2 + 3x_3 \leq 5$

and $x_1, x_2, x_3 \geq 0$.

8. Briefly describe the origin of Operations Research (5)

9. (5)

Express the limitations of Linear Programming.

10. Evaluate basic solutions of the following equations. (5)

$$3x_1 + 2x_2 + x_3 = 9$$

$$x_1 + 2x_2 + x_3 = 7$$

11. Calculate the value of objective function of the LPP (5)

$$Max\ z = 5x_1 + 3x_2$$

s.t

$$3x_1 + 5x_2 = 15$$
$$5x_1 + 2x_2 = 10$$
$$x_1,\ x_2 \geq 0$$

12. A firm makes two types of furniture – chairs and tables. The profit for each product as calculated by the accounting department is Rs. 20 per chair and Rs.30 per table. Both products are to be processed on three machines M_1, M_2, M_3. The time required in hours by each product and total time available in hours per week on each machine is as follows: (5)

Machine	Chair	Table	Available Time(hrs)
M_1	3	3	36
M_2	5	2	50
M_3	2	6	60

Write a mathematical formulation to this linear programming problem to maximize the profit.

OR

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)

Use the graphical method to write the solution this problem.

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