C 24254

(Pages : 5)

Name.....

Reg. No.....

FOURTH SEMESTER M.A. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2022

(CBCSS)

Econometrics

ECM 4C 13—LINEAR PROGRAMMING AND ITS APPLICATIONS IN ECONOMICS

(2020 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Part A

Answer **all** *questions.*

Each bunch of **five** *questions carries a weightage of* 1.

1. In a transportation problem with 4 supply points and 5 demand points, how many constraints are required in its formulation ?

   (a) 20.
   (b) 1.
   (c) 0.
   (d) 9.

2. If for a given solution a slack variable is equal to zero then, :

   (a) The entire amount of resource with the constraint in which the slack variable appears has been consumed.
   (b) The solution is optimal.
   (c) The solution is infeasible.
   (d) None of the above.

3. A set of vectors is linearly dependent if there is a non-trivial linear combination of the vectors that equals ————————.

(a) 3. (b) 2.

(c) 1. (d) 0.

4. In Integer Programming the variables are integer values and the objective function and equations are ————————.

(a) Curvilinear. (b) Linear.

(c) Quadratic. (d) Cubic.

5. ———————— is a set of points in a plane where the line segment joining any two points in the set, completely lies in the set.

(a) Quotient space. (b) Convex set.

(c) Subspace. (d) Inner product.

6. In the simplex method, a step in which one changes from a basis to an adjacent basis ; both representing the same extreme point solution is called a ————————.

(a) Unrestricted variable. (b) Unbounded solution.

(c) Degenerate iteration. (d) Orthogonality.

7. Feasible region is the set of points which satisfy :

(a) The objective functions. (b) Some the given constraints.

(c) All of the given constraints. (d) None of these.

8. In game theory, the linear programming technique is used for solving ———————— of dimensions greater than (2 × 2) size.

(a) Zero sum game. (b) Subspaces.

(c) Mixed strategy games. (d) None of the above.

9. For a maximization problem the objective function coefficient for an artificial variable is :

(a) Zero. (b) + M.

(c) – M. (d) None of the above.

10. When the game does not have a saddle point, then the following method is used to solve the game :

(a) Linear Programming method. (b) Minimax and maximin criteria.

(c) Algebraic method. (d) Graphical method.

11. If a two-person zero-sum game is converted to a Linear Programming Problem :

(a) The number of constraints is two only.

(b) If row player represents Primal problem, Column player represent Dual problem.

(c) There will be no objective function.

(d) Number of variables must be two only.

12. The optimal value of the objective function is attained at the points :

(a) Given by intersection of lines representing in equations with axes only.

(b) Given by intersection of lines representing in equations with X-axis only.

(c) Given by corner points of the feasible region.

(d) At the origin.

13. The solution to a transportation problem with m rows and n columns is feasible if the number of positive allocations are :

(a) $m+n-1$. (b) $m+n$.

(c) $m+n+1$. (d) $m \times n$.

14. _____ is a subspace whose dimension is one less than that of its ambient space.

(a) Quotient space. (b) Hyperplane.

(c) Sub Spare. (d) Inner product.

15. The Gomory Cutting Plane Algorithm is also known as _____.

(a) Search algorithms. (b) Fractional Dual Algorithm.

(c) Primality testing algorithms. (d) Sort algorithms.

(15 × 1/5 = 3 weightage)

Part B (Very Short Answer Questions)

Answer any **five** *questions.*
Each question carries 1 *weightage.*

16. Define Quotient Space.

17. What is a transportation algorithm ?

18. Why do we need artificial variables ?

19. What is the importance of duality theorem ?

20. What is branch technique ?

21. What is meant by an inner product space ?

22. Maximize $Z = 11x + 8y$ subject to $x \leq 4, y \leq 6, x + y \leq 6, x \geq 0, y \geq 0$.

23. What is meant by Linear dependence ?

(5 × 1 = 5 weightag

Part C (Short Answer Questions)

Answer any **seven** *questions.*
Each question carries 2 weightage.

24. What is called an Unbalanced transportation problem ?

25. What is the Duality Theorem of linear programming ?

26. Bring out the difference between a feasible solution and a basic solution.

27. Why is orthogonality important ?

28. When does Degeneracy occur ?

29. Solve the given linear programming problems graphically.

Maximize $Z = 8x + y$ and the constraints are :
$x + y \leq 40$,
$2x + y \leq 60$,
$x \geq 0, y \geq 0$.

30. Differentiate between pure integer programming and mixed integer programming.

31. Bring out the various steps in transportation algorithm?

32. Bring out the features of duality theory in LPP.

33. Write a short note on convex sets.

(7 × 2 = 14 weightage)

Part D (Essay Questions)

Answer any **two** *questions.*
Each question carries 4 *weightage.*

34. Explain the Theorems of Linear Programming Problem.

35. Use duality theory to determine whether $x_1 = 3, x_2 = 0, x_3 = -2, x_4 = 0,$ is an optimal solution of the linear programming problem.

Maximize $z = 10x_1 - 8x_2 + 8x_3 + 15x_4$
subject to $x_1 \geq 0, x_2 \geq 0$
$7x_1 - 2x_2 + 3x_3 + 7x_4 \leq 15$
$8x_1 + 5x_2 + 4x_3 - 2x_4 \leq 18$
$4x_1 + 3x_2 - 2x_3 - 3x_4 = 16.$

36. Describe the algorithm for Gomory's Cutting plane.

37. Explain in detail how does the transportation problem addressed by the Linear Programming ?

(2 × 4 = 8 weightage)