Seat No. : _____

AD-154

April-2019

M.Sc., Sem.-II

409 : Statistics
(Mathematical Programming)
(New)

Time : 2:30 Hours] **[Max. Marks : 70**

Note : Attempt **all** questions.

1. (A) (i) Explain the revised simplex method. **7**

(ii) Explain the dual simplex method. **7**

OR

(i) Compare the revised simplex method with simplex method and bring out the salient points of differences.

(ii) Show that if either the primal or the dual problem has a finite optimal solution, then the other one also possess the same, and the optimal values of the objective functions of the two problems are equal, Max. Z_x = Min. Z_y.

(B) Answer any **four** : **4**

(i) Revised simplex method requires more computations than the ordinary simplex method.

(a) True (b) False

(ii) Revised simplex method automatically generates the inverse of the current basis matrix and the new basic feasible solution as well.

(a) True (b) False

(iii) The right - hand side constant of a constraint in a primal problem appears in the corresponding dual as

(a) a co-efficient in the objective function

(b) a right-hand side constant of a constraint

(c) an input-out co-efficient

(d) None of the above

(iv) If dual has an unbounded solution, primal has

(a) no feasible solution (b) unbounded solution

(c) feasible solution (d) None of the above

(v) If i^{th} constraint in the primal is an equality, then the i^{th} dual variable is unrestricted in sign.

(a) True (b) False

(vi) Give one advantage of duality.

2. (A) (i) Discuss sensitivity analysis with respect to change in the objective function co-efficient c_j. **7**

(ii) Discuss sensitivity analysis with respect to change in the component 'b_i' of vector b. **7**

OR

(i) Discuss sensitivity analysis with respect to addition of new variable.

(ii) Explain the method of solving a zero-sum two person game as a linear programming problem.

(B) Answer any **four** : **4**

(i) A change in the objective function for a non-basic variable can affect

(a) $c_j - z_j$ values of all non-basic variables.

(b) $c_j - z_j$ values of all basic variables.

(c) only the $c_j - z_j$ value of that variable.

(d) None of the above

(ii) The right-hand side range is often referred to as the range of

(a) improvement (b) feasibility

(c) infeasibility (d) optimality

(iii) Define a fair game.

(iv) Game theory is the study of

(a) selecting optimal strategies (b) resolving conflict between players

(c) both (a) and (b) (d) None of the above

(v) What happens when maximin and minimax values of the game are same ?

(a) no solution exists (b) solution is mixed

(c) saddle point exists (d) None of the above

(vi) In a mixed strategy game

(a) no saddle point exist

(b) each player selects the same strategy without considering other player's choice.

(c) each player always selects same strategy

(d) All of the above

3. (A) (i) Explain Gomory's all integer cutting plane method. **7**

(ii) Explain branch and bound method for solving an integer programming problem. What is the main disadvantage of this method ? **7**

OR

(i) What is dynamic programming and what sort of problems can be solved by it ? State Bellman's principle of optimality.

(ii) What is fractional programming? Explain with example, how will you solve the linear fractional programming problem.

(B) Answer any **three** : **3**

(i) The situation of multiple solutions arises with

(a) cutting plane method (b) branch and bound method

(c) both (a) and (b) (d) None of the above

(ii) The corners of the reduced feasible region of an integer LP problem contains

(a) only integer solution (b) optimal integer solution

(c) only non-integer solution (d) None of the above

(iii) A non-integer variable is chosen in the optimal simplex table of the integer LP problem to

(a) leave the basis (b) enter the basis

(c) to construct a Gomory cut (d) None of the above

(iv) Dynamic programming approach

(a) optimizes a sequence of interrelated decision over a period of time

(b) provides optimal solution to single period decision-problem

(c) provides optimal solution to long-term corporate planning problems

(d) All of the above

(v) The return function in a DP model depends on

(a) stages (b) states

(c) alternatives (d) All of the above

4. (A) (i) State some problem areas in management where goal programming might be applicable. **7**

(ii) Explain graphical solution method for goal programming. **7**

OR

(i) Explain the procedure to formulate a goal programming model.

(ii) Explain modified simplex method of goal programming.

(B) Answer any **three** : **3**

(i) In GP problem, goals are assigned priorities such that.

(a) higher priority goals must be achieved before lower priority goals

(b) goals may not have equal priority

(c) goals of greatest importance are given lowest priority

(d) All of the above

(ii) For applying a GP approach, the decision -maker must

(a) set targets for each of the goals

(b) assign pre-emptive priority to each goal

(c) assume that linearity exists in the use of resources to achieve goals

(d) All of the above

(iii) The deviational variable in the basis of the initial simplex table of GP problem is

(a) positive deviational variable (b) negative deviational variable

(c) both (a) and (b) (d) artificial variable.

(iv) If the largest value of each goal in the 'solution-value X_B' column is zero, then it indicates

(a) multiple solution (b) infeasible solution

(c) optimal solution (d) None of the above

(v) In simplex method of goal programming, the variable to enter the solution mix is selected with

(a) lowest priority row and most negative $c_j - z_j$ value in it.

(b) lowest priority row and most positive $c_j - z_j$ value in it.

(c) highest priority row and most negative $c_j - z_j$ value in it.

(d) highest priority row and most positive $c_j - z_j$ value in it.

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Note : Attempt **all** questions.

1. (A) (i) Describe the dual simplex method for solving a linear programming problem. **7**

(ii) Compare the revised simplex method with simplex method and bring out the salient points of differences. **7**

OR

(i) Show that if either the primal or the dual problem has a finite optimal solution, then the other one also possess the same, and the optimal values of the objective functions of the two problems are equal, Max. Z_x = Min. Z_y.

(ii) Show that if either the primal or the dual LP problem has an unbounded objective function value, then the other problem has no feasible solution.

(B) Answer any **four** : **4**

(i) Revised simplex method requires more computations than the ordinary simplex method.

(a) True (b) False

(ii) Revised simplex method automatically generates the inverse of the current basis matrix and the new basic feasible solution as well.

(a) True (b) False

(iii) The right-hand side constant of a constraint in a primal problem appears in the corresponding dual as

(a) a co-efficient in the objective function

(b) a right-hand side constant of a constraint

(c) an input-out co-efficient

(d) None of the above

(iv) Principle of complementary slackness states that

(a) primal slack × dual main = 0 (b) primal main × dual surplus = 0

(c) both (a) and (b) (d) None of the above

(v) If i^{th} constraint in the primal is an equality, then the i^{th} dual variable is unrestricted in sign.

(a) True (b) False

(vi) Give one advantage of duality.

2. (A) (i) Discuss sensitivity analysis with respect to deletion of existing variable. **7**

(ii) Discuss sensitivity analysis with respect to deletion of existing constraint. **7**

OR

(i) Discuss parametric linear programming with respect to variation in the objective function co-efficients.

(ii) Explain the following terms : (i) minimax-maximin principle (ii) Principles of dominance.

(B) Answer any **four** : **4**

(i) A change in the objective function for a non-basic variable can affect

(a) $c_j - z_j$ values of all non-basic variables.

(b) $c_j - z_j$ values of all basic variables.

(c) only the $c_j - z_j$ value of that variable.

(d) None of the above

(ii) The right-hand side range is often referred to as the range of

(a) improvement (b) feasibility

(c) infeasibility (d) optimality

(iii) Define a fair game.

(iv) Define a strictly determinable game.

(v) What do you understand by saddle point ?

(vi) In a mixed strategy game

(a) no saddle point exist

(b) each player selects the same strategy without considering other player's choice

(c) each player always selects same strategy

(d) All of the above

3. (A) (i) Explain the method of solving a zero-sum two person game as a linear programming problem. **7**

(ii) Explain Gomory's mixed integer cutting plane method. **7**

OR

(i) Discuss dynamic programming with suitable examples.

(ii) Discuss zero-one integer programming with examples.

(B) Answer any **three** : **3**

(i) The situation of multiple solutions arises with

(a) cutting plane method (b) branch and bound method

(c) both (a) and (b) (d) None of the above

(ii) A non-integer variable is chosen in the optimal simplex table of the integer LP problem to

(a) leave the basis (b) enter the basis

(c) to construct a Gomory cut (d) None of the above

(iii) Dynamic programming approach

(a) optimizes a sequence of interrelated decision over a period of time.

(b) provides optimal solution to single period decision-problem.

(c) provides optimal solution to long-term corporate planning problems.

(d) All of the above

(iv) Define 'state' in dynamic programming.

(v) Define 'stage' in dynamic programming.

4. (A) (i) Discuss the important areas where goal programming can be effectively used. **7**

(ii) Explain graphical solution method for goal programming. **7**

OR

(i) Explain the procedure to formulate a goal programming model.

(ii) Explain alternative simplex method for goal programming.

(B) Answer any **three** : **3**

(i) In GP problem, goals are assigned priorities such that

(a) higher priority goals must be achieved before lower priority goals.

(b) goals may not have equal priority.

(c) goals of greatest importance are given lowest priority.

(d) All of the above

(ii) For applying a GP approach, the decision -maker must

(a) set targets for each of the goals

(b) assign pre-emptive priority to each goal

(c) assume that linearity exists in the use of resources to achieve goals

(d) All of the above

(iii) What do you understand by Penalty weights ?

(iv) Explain Deviational variables.

(v) The deviational variable in the basis of the initial simplex table of GP problem is

(a) positive deviational variable (b) negative deviational variable

(c) both (a) and (b) (d) artificial variable