SLR-ES-385

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination March/April-2019
Statistics
OPTIMIZATION TECHNIQUES

Day & Date: Thursday, 25-04-2019 Max. Marks: 70
Time: 03:30 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose Correct Alternative from the following. **14**

1) Components of linear programming problem
   a) Linear objective function b) Linear constraints
   c) Non negative decision variables d) All of the above

2) If line segment joining to any two points in set is also belong to that set then such set is called _____
   a) Bounded set b) Concave set
   c) Convex set d) Closed set

3) If i^{th} constraint of LPP is deleted then the optimum solution is also changed then such constraint is called _____
   a) Redundant constraint b) Binding constraint
   c) Unbinding constraint d) None of these

4) Which of the following is not correct?
   a) Associated with every LPP, there is always another LPP which is based on the same data and having same solution
   b) Given LPP is called primal while associated LPP is called its dual
   c) It is necessary to convert the inequality constraint into equality constraints for writing the dual an LPP
   d) Dual of dual is primal

5) What is not a solution to the following LPP
   Max $Z = x_1 + x_2$,
   Subject to,
   $x_1 + 2x_2 \leq 4$,
   $3x_1 + 2x_2 \leq 10$,
   $x_1 \geq 0, x_2 \geq 0$
   a) $x_1 = 0, x_2 = 2$ b) $x_1 = 2, x_2 = 0$
   c) $x_1 = 2, x_2 = 1$ d) $x_1 = 2, x_2 = 2$

6) Dual has unbounded solution then primal has _____
   a) Unique feasible solution b) Optimal solution
   c) Infeasible solution d) None of the above

7) Post optimal analysis is technique to _____
   a) Determine how optimum solution to an LPP changes in response to problem inputs
   b) Allocate resources optimally
   c) Minimize cost operations
   d) Spell out the relation between dual and its primal

8) The zero -one programming problem requires _____
   a) Decision variables to have values either 0 or 1
   b) The decision variables have coefficients between 0 and 1
   c) All constraints have coefficients between 0 and 1
   d) All of the above

9) If $X'QX$ is positive semi definite then, it is _____
   a) Strictly convex
   b) Strictly concave
   c) Convex
   d) Concave

10) In two person zero sum game is said to be fair if _____
   a) The upper value and lower value of the game are not equal
   b) The upper value is more than lower value of the game
   c) The upper value and lower value of the game are same and equal to zero
   d) None of the above

11) A minimax and maximin values of the game are same, then _____
   a) There is saddle point
   b) Solution does not exists
   c) Strategies are mixed
   d) None of the above

12) Mixed strategies of the game can be solved by _____
   a) Matrix method
   b) Algebraic method
   c) Graphical method
   d) All of the above

13) The QPP is NLPP with quadratic objective function and _____
   a) Linear inequality constraints
   b) Non-linear inequality constraints
   c) Non-linear equality constraints
   d) No constraints

14) Simplex method of solving linear programming gives _____
   a) Always optimal solution
   b) at any of the iteration it may indicate that problem has unbounded solution
   c) at any of the iteration it may indicate that problem has infeasible solution
   d) None of the above

Q.2 A) Answer the following (Any four) **08**

1) Define degenerate basic feasible solution.
2) Define artificial variable.
3) Define pure and mixed strategies with reference to game theory.
4) Define all and mixed integer programming problem.
5) Explain post optimal analysis.

B) Write Notes on (Any two) **06**

1) Big-M method
2) Effect of Addition and deletion of variable on optimal solution of LPP
3) Recursive equation approach

Q.3 A) Answer the following (Any two) **08**

1) Develop necessary of KKT conditions for an optimal solution to a quadratic programming problem.
2) Write down graphical procedure to solve two persons zero sum game.
3) Use two phase method to solve following
   Maximize $Z = 5x_1 + 3x_2$,
   subject to,
   $2x_1 + x_2 \leq 1$,
   $x_1 + 4x_2 \geq 6$,
   $x_1, x_2 \geq 0$

B) Answer the following (Any one) **06**

1) State and prove basic duality theory.
2) Explain Branch and Bound method to solve integer linear programming problem.

Q.4 A) Answer the following (Any two) **10**

1) Explain Gomory's fractional cut method to solve integer programming problem.
2) Use dynamic programming to solve the following LPP
   Max $Z = 3x_1 + 5x_2$
   Subject to
   $x_1 \leq 4$, $x_2 \leq 6$, $3x_1 + 2x_2 \leq 18$, x_1 ,$x_2 \geq 0$
3) State and prove complimentary slackness theorem.

B) Answer the following (Any one) **04**

1) Obtain the range of change in b_i values to maintain feasibility of the optimal solution.
2) Obtain optimum strategies and value of the game with payoff matrix of player A is given below,

$$\begin{bmatrix} 2 & 3 & 11 \\ 7 & 5 & 2 \end{bmatrix}$$

Q.5 Answer the following (Any two) **14**

a) Write down dual simplex algorithm.

b) Solve the following quadratic problem using Beal's method
Max $Z = 2x_1 + x_2 - x_1^2$
Subject to
$2x_1 + 3x_2 \leq 6$, $2x_1 + x_2 \leq 4$, x_1 , $x_2 \geq 0$

c) Solve the following LPP
Maximize $Z = -x_1 + 2x_2 - x_3$
Sub to

$3x_1 + x_2 - x_3 \leq 10$
$-x_1 + 4x_2 + x_3 \geq 6$
$x_2 + x_3 \leq 4$
$x_1, x_2, x_3 \geq 0$

SLR-JS-386

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination Oct/Nov-2019
Statistics
OPTIMIZATION TECHNIQUES

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Which of the following is not assumption of LPP?
   a) Certainty b) Additively
   c) Creativity d) Proportionality

2) To maintain optimality of current solution for a change Δc_k in the coefficient c_k of non basic variable, we must have _____.
   a) $\Delta c_k = z_k - c_k$ b) $\Delta c_k \geq z_k - c_k$
   c) $\Delta c_k \leq z_k - c_k$ d) $\Delta c_k = z_k$

3) Slack variable_____.
   a) Which can be added in less than equal to constraint
   b) Which can be added in greater than equal to constraint
   c) Which can be a added both types of constraint
   d) Which can be added in equality type constraint

4) Redundant constraint_____.
   a) Can not affect on feasible solution space
   b) If we add then decrease the feasible solution space
   c) If we add then increase the feasible solution space
   d) None of these

5) Dual simplex method applicable to those LPP's that starts with _____.
   a) An infeasible solution
   b) An infeasible but optimum solution
   c) A feasible solution
   d) A feasible and optimal solution

6) At any iteration of the usual simplex method, if there exist at least one basic variable in the basis at zero level and all $z_j - c_j \geq 0$, the current solution is _____.
   a) Infeasible b) Unbounded
   c) Non-degenerate d) Degenerate

7) In mixed integer programming problem _____.
   a) Different objective functions are mixed together
   b) All of the decision variables requires integer solutions
   c) Only few of the decision variables requires integer solutions
   d) None of these

8) Branch and bound method divides the feasible solution space into smaller parts by _____.
   a) Enumerating b) Branching
   c) Bounding d) All of the above

9) Dynamic programming deals with the _____.
   a) Multistage decision making problems
   b) Single stage decision making problems
   c) Time dependent decision making problems
   d) Problem which fix the levels of different so as to maximize profit or minimize cost.

10) The pay of value for which each player in the game always selects the same strategy is called the _____.
   a) Equilibrium point b) Saddle point
   c) Both (a) and (b) d) Pivot point

11) Recursive approach method used in _____.
   a) Dynamic programming b) Linear programming
   c) Quadratic programming d) Goal programming

12) The of pay-off matrix of a game can be reduced by using the principle of _____.
   a) Dominance b) Inversion
   c) Transpose d) Rotation reduction

13) If the quadratic form X^TQX is positive definite, then it is_____.
   a) Strictly convex b) Strictly concave
   c) Convex d) Concave

14) Quadratic programming problem concern with non linear programming problem with quadratic objective function subject to _____.
   a) Non linear inequality constraints
   b) Non linear equality constraints
   c) linear inequality constraints
   d) No constraints

Q.2 A) Answer the following questions.(Any Four) **08**

1) Define general linear programming problem. Also explain the terms solution and feasible solution.
2) Explain a dynamic programming problem.
3) Describe two persons zero sum game.
4) Explain effect of addition of new variable on the optimality of optimum feasible solution.
5) Write down characteristics of dynamic programming.

B) Write Notes.(Any Two) **06**

1) Two phase method
2) Dominance property
3) Non-linear programming problem

Q.3 A) Answer the following questions. (Any Two) **08**

1) Find the maximum value of $Z = 50x_1 + 60x_2$, subject to constraints $2x_1 + 3x_2 < 1500, 3x_1 + 2x_2 \leq 1500, 0 \leq x_1 \leq 400, 0 \leq x_2 \leq 400$
2) Solve the following game with payoff matrix of player A

Player B

$$\text{Player A} \begin{pmatrix} 3 & 2 & 4 & 0 \\ 3 & 4 & 2 & 4 \\ 4 & 2 & 4 & 0 \\ 0 & 4 & 0 & 8 \end{pmatrix}$$

3) Write down Gomory's fractional cut method to solve all integer programming problem.

B) Answer the following questions. (Any One) **06**

1) Write down simplex algorithm to solve linear programming problem.
2) Solve following LPP using dynamic programming
$Maximize\ Z = 3x_1 + 7x_2$, subject to constraints $x_1 + 4x_2 < 8, 0 \leq x_2 \leq 2, x_1 \geq 0$

Q.4 A) Answer the following questions. (Any Two) **10**

1) Explain the terms convex set and convex combinations. Also show that set of all feasible solutions is convex.
2) Let x_0 and w_0 be the feasible solutions of primal $\{Maximize\ f(x) = cx, sub.to\ Ax \leq b, x \geq 0\}$ and dual $\{\min g(w) = b'w, sub\ to\ A'w \geq c', w \geq 0\}$ problems respectively. Show that x_0 and w_0 are optimal solutions to the respective problems if and only if $cx_0 = b'w_0$
3) Write an procedure to obtain solution of quadratic programming using Wolfe's method.

B) Answer the following questions. (Any One) **04**

1) Discuss procedure to obtain 2x2 games without saddle point.
2) State and prove complementary slackness theorem.

Q.5 Answer the following questions. (Any Two) **14**

1) Use Branch and Bound method to solve following integer programming problem
$Maximize\ Z = 7x_1 + 9x_2$, subject to constraints.
$-x_1 + 3x_2 < 6, 7x_1 + x_2 \leq 35, x_2 \leq 7,\ x_1, x_2 \geq 0$ and integers
2) Use simplex method to solve following game.

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{pmatrix} 4 & 2 & 4 \\ 2 & 4 & 1 \\ 4 & 1 & 8 \end{pmatrix} \end{array}$$

3) Describe effect of change in coefficients of objective function $c_j's$ in sensitivity analysis.