RAYALA SEEMA UNIVERSITY: KURNOOL
SEMESTER-WISE REVISED SYLLABUS UNDER CBCS, 2020-21
Three year B.A./B.Sc
Domain Subject: STATISTICS (WM)
SEMESTER-V
Course 6A: **OPERATIONS RESEARCH - I**
(Skill Enhancement Course (Elective), 05 Credits
Max. Marks: Theory :100 + Practicals:50)
(Hours: Teaching:75 hrs, Training: 15 hrs)

Objective: The Objective of the Course is to introduce the basic concepts of Operational Research and linear programming to the students.

Learning Outcomes:
After learning this course, the student will be able

1. To know the scope of Operations Research
2. To link the OR techniques with business environment and life sciences
3. To convert real life problems into mathematical models
4. To find a solution to the problem in different cases
5. To inculcate logical thinking to find a solution to the problem

UNIT-I

Introduction of OR – Origin and development of OR, Nature and features of OR, Scientific Method in OR, Advantages and limitations of O.R, Applications of Operation Research.

Linear programming problem (LPP) -Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear programming of problem. Graphical solution of linear programming problems

UNIT-II

General linear programming Problem(GLP)-Standard and Canonical forms of LPP, Definitions of Slack variable, Surplus variable, unrestricted Variable, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution.

Simplex Method- Introduction, Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case)(Two variables only)

UNIT-III

Artificial variable technique - Big-M method and Two-phase simplex method **(Simple problems only with two variables)**

Concepts of Degeneracy in LPP, Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method. **(No problems required)**

UNIT-IV

Duality in Linear Programming- Concept of duality, Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Relation between the solution of Primal and Dual problem(statements only). Using duality to solve Primal Problems

UNIT-V

Post Optimal Analysis- Changes in cost Vector **C**, Changes in the Requirement Vector B and changes in the Coefficient Matrix **A**. Structural Changes in a LPP.

Reference Books:

1. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohn, Operations Research, Sultan Chand and sons, New Delhi.
3. J.K. Sharma, Operations Research and Application, Mc.Millan and Company, New Delhi.
4. Taha H.M: Operations Research: An Introduction : Mac Millan.
5. S.Kalavathy: Operations Research: Vikas Publications

Practical/Lab to be performed on a computer using OR/Statistical packages

Conduct at least 6 Practicals from the following

1. Mathematical Formulation of LPP
2. Linear Programming Problem using Graphical Method
3. LPP with simplex method.
4. Charne's M - method.
5. Two Phase Simplex method.
6. Illustration of following special cases in LPP using Simplex method
   - (i) Unrestricted variables
   - (ii) Unbounded solution
   - (iii) Infeasible solution
   - (iv) Alternative or multiple solutions.
7. Problems based on Principle of Duality.
8. Problems based on Post Optimal Analysis.

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THREE YEAR B.A./B.Sc DEGREE EXAMINATION
(W.E.F 2020-21 ADMITTED BATCH)
STATISTICS (WM)
(SKILL ENHANCEMENT COURSES)
SEMESTER – V
Course 6A: OPERATIONS RESEARCH - I

Time: 3 Hours **Max. Marks : 70**

SECTION – A

Answer any FIVE Questions:

5 X 4 = 20M

1. Describe the Origin and Development of Operations Research
2. A Course mill produces two grades of Courses namely X and Y. Because of raw material restrictions it cannot produce more than 400 tons of grade X and 300 tons of grade Yin a week. There were 160 production hours in a week. It requires 2 and 4 hours to produce a tons of products X and Y respectively with corresponding profits of Rs.2000/-and Rs.5000 per tons. Formulate the above as LPP to maximize the profit
3. Define the standard and canonical forms of LPP
4. Explain the Big M method in LPP
5. State the relations between solution of Primal and Dual Problem
6. Write the dual of the following LPP

   Maximize $z = x_1 - x_2 + 3x_3$

   Subject to the constraints

   $x_1 + x_2 + x_3 \leq 10$

   $2x_1 - x_3 \leq 2$

   $2x_1 - 2x_2 - 3x_3 \leq 6$

   $x_1, x_2, x_3 \geq 0$
7. Explain the case of changes in Requirement vector in Post Optimal Analysis
8. Mention the case of changes in Cost vector in Post Optimal Analysis

PART – B

Answer any FIVE questions : **5 X 10 = 50M**

9. Define Operations Research? What are the applications of Operations Research?
10. Find the maximum value of $Z=5X_1 + 7X_2$ using Graphical Method

    Subject to the constraints

    $X_1 + X_2 \leq 4$

    $3X_1 + 8X_2 \leq 24$

    $10X_1 + 7X_2 \leq 35$

    $X_1, X_2 \geq 0$
11. Explain the Computational Proceedure of simplex algorithm.
12. Solve the following problem using Simplex Method

    Maximize $z = 3x_1 + 2x_2$

    subject to

    $-x_1+2x_2 \leq 4$

    $3x_1+2x_2 \leq 14$

    $x_1 - x_2 \leq 3$

    $x_1, x_2 \geq 0$
13. Solve the following Linear Programming Problem using Big M method

    Maximize $z = -2x_1-x_2$

    Subject to the constraints

    $3x_1+x_2 = 3$

    $4x_1+3x_2 \geq 6$

    $x_1+2x_2 \leq 4$

    $x_1, x_2 \geq 0$
14. Solve the following Linear Programming Problem using Two Phase Simplex method

    Maximize $z = x_1+x_2$

    Subject to the constraints

    $2x_1+x_2 \geq 4$

    $x_1+7x_2 \geq 7$

    $x_1, x_2 \geq 0$

15. Explain various steps in formulation of Dual Linear Programming Problem

16. Apply the Principle of duality to solve the LPP

Maximize $z = 3x_1+2x_2$

Subject to the constraints

$x_1+x_2 \geq 1$

$x_1+x_2 \leq 7$

$x_1+2x_2 \leq 10$

$x_1, x_2 \geq 0$

17. How to deal with the structural changes in LPP in post optimal situations

18. Discuss the effect on the optimum solution of the changes in the requirement vector for the following LPP

Maximize $z = 2x_1+x_2$

Subject to the constraints

$3x_1+5x_2 \leq 15$

$6\ x_1+2x_2 \leq 24$

$x_1, x_2 \geq 0$