

Semester – wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.A./B.Sc.  
Domain Subject: **Statistics**  
**(With Mathematics Combination Common to B.A./ B.Sc)**

Course 7A: **OPERATIONS RESEARCH - II**  
(Skill Enhancement Course(Elective), 05 Credits  
Max. Marks: Theory :100 + Practicals: 50

*Objective: To enrich the knowledge of students with advanced techniques of linear programming problem along with real life applications.*

**Learning Outcomes:**

After learning this course, the student will be able

1. To solve the problems in logistics
2. To find a solution for the problems having space constraints
3. To minimize the total elapsed time in an industry by efficient allocation of jobs to the suitable persons.
4. To find a solution for an adequate usage of human resources
5. To find the most plausible solutions in industries and agriculture when a random environment exists.

**UNIT -I**

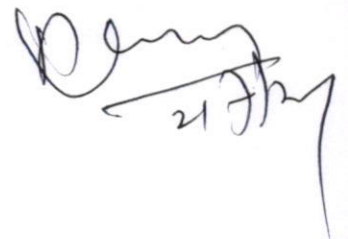
Transportation Problem- Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem- North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution- MODI method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization TP. Transshipment Problem.

**UNIT-II**

Assignment Problem -Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment problem, Unbalanced Assignment problem. The Traveling salesman problem, Formulation of Traveling salesman problem as an Assignment problem and Solution procedure.

**UNIT-III**

Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem- problems with n-jobs on two machines, Gantt chart, algorithm for n jobs on three machines problem- problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m-machines. Graphical method for two jobs on m- machines.



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## UNIT-IV

Network Scheduling: Basic Components of a network, nodes and arcs, events and activities— Rules of Network construction – Time calculations in networks - Critical Path method (CPM) and PERT.

## UNIT -V

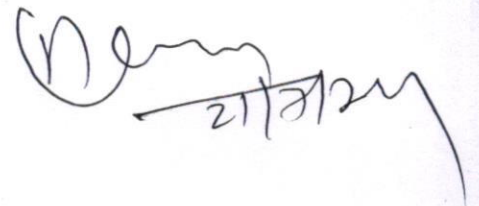
Game Theory: Two-person zero-sum games. Pure and Mixed strategies. Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of  $2 \times 2$  rectangular games. Graphical method of solving  $2 \times n$  and  $m \times 2$  games. Dominance Property. Matrix oddment method for  $n \times n$  games. Only formulation of Linear Programming Problem for  $m \times n$  games.

### 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. Gass: Linear Programming. Mc Graw Hill.
5. Hadly : Linear programming. Addison-Wesley.
6. Taha : Operations Research: An Introduction : Mac Millan.
7. Dr.NVS Raju; Operations Research, SMS education,

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

1. IBFS of transportation problem by using North- West corner rule, Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization and minimization cases),
4. Solution of sequencing problem—processing of  $n$  jobs through two machines
5. Solution of sequencing problem- processing of  $n$  jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Graphical method of solving for  $m \times 2$  and  $2 \times n$  games.
9. Solution of  $m \times n$  games by dominance rule.
10. Solution of  $n \times n$  games by using matrix oddment method.
11. Linear programming method for solving  $m \times n$  games.



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