# BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024

## One Year Diploma in Operations Research

**(For the candidates to be admitted from the academic year 2006-2007 onwards)**

| Semester | Title of the Paper | Exam Hours | University Exam Marks |
|---|---|---|---|
| I | Paper I – Operations Research – I | 3 | 100 |
| | Paper II – Operations Research – II | 3 | 100 |
| | Paper III – Statistical Methods | 3 | 100 |
| II | Paper IV – Operations Research – III | 3 | 100 |
| | Paper V – Operations Research – IV | 3 | 100 |
| | Paper VI – Programming with C (Theory only) | 3 | 100 |
| | **TOTAL MARKS** | | **600** |

# SEMESTER I

## PAPER I – OPERATIONS RESEARCH – I

**Unit I**

Operations Research – An Overview – Mathematical Formulation of Linear Programming Problem.

**Unit II**

Graphical Solution of Linear Programming Problem.

**Unit III**

Solution of Linear Programming Problem by Simplex Method using Slack Variables only.

**Unit IV**

Solution of Linear Programming Problem by Big-M Method and Two-phase method.

**Unit V**

Duality in Linear Programming (Problems only)

**Text Book:**

Operations Research by Kanthiswarup, P.K. Gupta, Manmohan 9$^{th}$ Revised Edition 2001, Reprint 2002. Sultan Chand & Sons, New Delhi.

Descriptions and Problems Only on the Chapters

Unit I  : Chapter 1 and Chapter 2
Unit II  : Chapter 3 : 3.1 to 3.5
Unit III : Chapter 4 : 4.1 to 4.3
Unit IV : Chapter 4 : 4.4 to 4.7
Unit V   : Chapter 5

# PAPER II – OPERATIONS RESEARCH – II

**Unit I**

Transportation Problem – General Transportation Problem – Loops in T.P. – Solution of T.P. – Initial Basic Feasible Solution.

**Unit II**

Optimal Solution by Modi Method – Stepping Stone Method – Unbalanced T.P. – Time Minimization Problems.

**Unit III**

Assignment Problem – Mathematical Formulation – Hungarian Method.

**Unit IV**

Special cases in Assignment Problem – Typical Assignment Problem – Travelling Salesman Problem.

**Unit V**

Decision Analysis – Decision Making Problem – Decision Making Process – Decision Making Environment – Decision Under Uncertainty – Under risk – Decision tree analysis – Problems.

**Text Book:**

Operations Research by Kanthiswarup & Others, Reprint 2002.

Descriptions and Problems alone need to be taught

Unit I  : Chapter 10 : 10.1 to 10.8 excluding 10.6
Unit II  : Chapter 10 : 10.11 to 10.14
Unit III : Chapter 11 : 11.1, 11.2, 11.3
Unit IV : Chapter 11 : 11.4, 11.5, 11.6
Unit V  : Chapter 16 : 16.1 to 16.7

# PAPER III – STATISTICAL METHODS

**Unit I**

Probability Space – Axiomatic theory – Addition, Multiplication theorems – Conditional Probability – Baye's Theorem.

**Unit II**

Discrete and Continuous Random Variables – Probability Distribution Functions – Cumulative Distribution Functions.

**Unit III**

Mathematical Expectations – Properties – Variance – Covariance.

**Unit IV**

Binomial, Poisson, Normal distributions – Their Characteristics.

**Unit V**

Tests Based on F distribution – Ratio of Variance, Analysis of Variance – One way and Two way Classification.

**Text Book:**

Fundamentals of Mathematical Statistics by Kapoor and Gupta, Sultan Chand & Sons 10th Revised Edition, August 2000. Reprint 2002.

Unit I       : Chapter 4
Unit II     : Chapter 5 : 5.1 to 5.4.2
Unit III    : Chapter 6 : 6.1 to 6.9
Unit IV   : Chapter 7 : 7.2 to 7.3.10
              Chapter 8 : 8.2 to 8.2.15
Unit V     : Chapter 14 : 14.5 to 14.5.5

**Reference Book:**

Statistical Methods by S.P.Gupta (Relevant Topics)

# SEMESTER – II

## PAPER – IV – OPERATIONS RESEARCH – III

**Unit I**

Game Theory – Two person Zero Sum Games – Basic Terms – Maxmin – Minimax Principle – Games without Saddle points – Mixed Strategies – Graphic solutions of 2xn and mx2 games.

**Unit II**

Inventory Control – Inventory Decisions – Cost Associated with Inventories – Factors affecting inventory control – E.O.Q. – Deterministic Problems with no shortages.

**Unit III**

Deterministic problems with shortages – E.O.Q. problems with price breaks.

**Unit IV**

Network Scheduling by Critical Path Method (CPM).

**Unit V**

Probability considerations in PERT – Distinction between PERT and CPM.

**Text Book:**

Operations Research by Kanthiswarup & Others, Sultan Chand & Sons, Reprint 2002 (9$^{th}$ Edition 2001).

Descriptions and Problems only on

Unit I       : Chapter 17 : 17.1 to 17.6
Unit II     : Chapter 19 : 19.1 to 19.6
Unit III    : Chapter 19 : 19.7 to 19.8
Unit IV    : Chapter 21 : 21.1 to 21.5
Unit V     : Chapter 21 : 21.6 to 21.7

# PAPER V – OPERATIONS RESEARCH – IV

## Unit I

Sequencing Problems of Sequencing, Processing of n jobs through 2 machines – n jobs through K machines 2 jobs through k machines.

## Unit II

Replacement Problems – Replacement of equipments that Deteriorates gradually – Replacement problems that fails suddenly.

## Unit III

Simulation : Simulation Models – Event type simulation – Generation of Random numbers – Monte-Carlo simulation – Simulation of Inventory Problems.

## Unit IV

Simulation of Queuing system – Maintenance Problems – Simulation in investment and Budgeting.

## Unit V

Non Linear Programming Problems – Formulation – General NLPP – Optimization with equality constraints.

**Text Book:**

Operations Research by Kanthiswarup & Others, Sultan Chand & Sons, Reprint 2002 (9$^{th}$ Edition 2001).

Descriptions and Problems only on

Unit I         : Chapter 12 : 12.1 to 12.6
Unit II        : Chapter 18 : 18.1, 18.2, 18.3
Unit III       : Chapter 23 : 23.1 to 23.8
Unit IV        : Chapter 23 : 23.9 to 23.12
Unit V         : Chapter 24 : 24.1 to 24.4

# PAPER VI – PROGRAMMING WITH C (Theory only)

## Unit I

Introduction to C – Constants, Variables, Data Types, Operators, Expressions – Managing Input, Output Operators.

## Unit II

Decision Making and Branching, Decision Making and Looping Statements.

## Unit III

Arrays – Structure and Unions

## Unit IV

User – Defined Functions - Handling of Character Strings.

## Unit V

i)     Program to calculate the area of a circle
ii)    Program to calculate simple and compound interest
iii)   Program to calculate the roots of a quadratic equation
iv)    Program to calculate the average of 'n' numbers
v)     Program to convert a line of lower case text to upper case
vi)    Program to determine the first 'n' Fibonacci Numbers
vii)   Program to determine the largest of three integers
viii)  Program to calculate the Factorial of an integers
ix)    Program for addition and multiplication of a matrix
x)     Program to arrange the list of numbers in ascending or descending order.

## Text Book:

Programming in ANSI C by E. Balagurusamy

Unit I        : Chapter 1, 2, 3 & 4
Unit II       : Chapters 5 and 6
Unit III      : Chapters 7 and 10
Unit IV       : Chapters 8 and 9

## Reference Book:

1.  "Programming with C" – Schaum's Series, 2$^{nd}$ Edition – Byron Gathfried (Relevant topics)
2.  'Let Us C' - by Yashavant Kanetkar (Relevant Topics)

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