MSTE-002
Industrial Statistics-II

Indira Gandhi National Open University
School of Sciences

Block

2

OPTIMISATION TECHNIQUES-II

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Curriculum and Course Design Committee

Prof. K. R. Srivathsan
Former Pro-Vice Chancellor
IGNOU, New Delhi

Prof. Parvin Sinclair
Former Pro-Vice Chancellor
IGNOU, New Delhi

Prof. Geeta Kaicker
Former Director, School of Sciences
IGNOU, New Delhi

Prof. Jagdish Prasad
Department of Statistics
University of Rajasthan, Jaipur

Prof. R. M. Pandey
Department of Bio-Statistics
AIIMS, New Delhi

Dr. Manish Trivedi
School of Sciences, IGNOU

Dr. Nitin Gupta
School of Sciences, IGNOU

Dr. Neha Garg
School of Sciences, IGNOU

Mr. Rajesh Kaliraman
School of Sciences, IGNOU

Prof. Rahul Roy
Theoretical Statistics and Mathematics Unit
Indian Statistical Institute, New Delhi

Prof. Diwakar Shukla
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Dr. Hari Singh Gaur University, Sagar

Prof. Rakesh Srivastava
Department of Statistics
M.S. University of Baroda, Vadodara

Prof. G. N. Singh
Department of Applied Mathematics
I.S.M., Dhanbad

Prof. Gulshan Lal Taneja
Department of Mathematics
M.D. University, Rohtak

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School of Sciences, IGNOU

Prof. Sujatha Varma
School of Sciences, IGNOU

Dr. S. Venkataraman
School of Sciences, IGNOU

Dr. Deepika
School of Sciences, IGNOU

Block Preparation Team

Prof. Jayant Dubey (**Editor**)
Department of Business Studies
BTIRT, Sironja, Sagar (MP)

Prof. Vijayshri (**Language Editor**)
School of Sciences, IGNOU

Prof. Gulshan Lal Taneja (**Units 5 to 8**)
Department of Mathematics,
M. D. University, Rohtak

Formatted By
Dr. Manish Trivedi
School of Sciences, IGNOU

Programme and Course Coordinator: Dr. Manish Trivedi

Block Production

Mr. Sunil Kumar, AR (P)
School of Sciences, IGNOU

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BLOCK 2 OPTIMISATION TECHNIQUES-II

In Block 1 of this course, you have learnt the graphical method and the simplex method of solving linear programming problems. You have also learnt some methods of finding the initial feasible solutions as well as the methods of obtaining the optimum solution of transportation problems.

With the rapid and continuous progress of mechanisation and automation, problems of machine maintenance have become of particular interest to production and operations management. To the modern-day management, maintenance is more than a mere synonym for repair. Instead, maintenance embraces a new idea of keeping the plant and equipment competitive and productive. For example, in a textile mill, a maintenance incharge with limited resources has to allocate maintenance staff to various jobs in such a way that the breakdown time is minimised. In this block, we discuss various techniques to optimise the processing/service time or total cost while dealing with queueing systems, sequential problems and inventory problems, respectively.The block is divided into four units.

In Unit 5 entitled **Assignment Problems**, we discuss various types of assignment problems, including travelling salesman problem and apply the Hungarian method for solving these problems.

Unit 6 entitled **Queueing Theory** explains the basic concepts, which would help you understand the techniques of queueing models thoroughly. We describe the fundamental structure and operating characteristics of a queueing system alongwith the M/M/1 queueing model and its applications in this unit.

Sequencing problems are quite common in real life. They arise whenever there is a choice of determining the order in which a number of jobs can be performed. Therefore, in Unit 7 entitled **Sequencing Problems**, we discuss some procedures for determining the optimum order or sequence of jobs for processes with n number of jobs to be completed through 2 machines and with 2 jobs to be completed through m number of machines, in some pre-assigned order, so as to optimise the total time involved.

In Unit 8 entitled **Inventory Models**, we discuss inventory control and various factors involved in inventory analysis. We also describe the models for determining the economic order quantity considering the situations: i) when demand is uniform, ii) when rates of demand are different in different cycles, iii) when shortages are allowed, iv) when replenishment is uniform, and v) when price (or quantity) discounts are given.

Notations and Symbols

Z	:	Objective function to be maximised or minimised
x_{ij}	:	j^{th} job assigned to the i^{th} person
c_{ij}	:	Amount of time taken by the i^{th} person to complete the j^{th} job
$N(t)$	:	Total number of occurrences of an event E in an interval of time t
λ	:	Average arrival rate
μ	:	Average departure rate
L_S	:	Average number of customers in the queueing system
L_q	:	Average number of customers in queue waiting to be served
W_q	:	Average time each customer spends waiting in the queue to get serviced
W_s	:	Average time each customer spends in the queueing system from entry into the queue to completion of the service
ρ	:	Traffic intensity or the utilisation factor
$P_n(t)$	:	Probability of n customers in an interval t
FCFS	:	First come, first served
LIFO	:	Last in, first out
Q	:	Number of units ordered (supplied) per order
D	:	Demand in units of inventory per year
N	:	Number of orders placed per year
TC	:	Total inventory cost
C_O	:	Ordering cost per order
C	:	Purchase or manufacturing price per unit inventory
C_h	:	Carrying or holding cost per unit per period of time the inventory is kept
C_s	:	Shortage cost per unit of inventory
t	:	Elapsed time between placement of two successive orders
r_p	:	Replenishment rate at which lot size Q is added to inventory.