NEERAJ®

MANAGEMENT OF MACHINES AND MATERIALS

M.S.-5

Chapter Wise Reference Book
Including Solved Sample Papers

By: *Manisha Chattopadhyay* M.Com.

Based on

I.G.N.O.U.

& Various Central, State & Other Open Universities

NEERAJ PUBLICATIONS
(Publishers of Educational Books)

Serving Education for Last 40 Years

Retail Sales Office:
1507, 1st Floor, Nai Sarak, Delhi - 6
Mob.: 8510009872, 8510009878
E-mail: info@neerajbooks.com
Website: www.neerajbooks.com

MRP ₹ 240/-

Published by:

NEERAJ PUBLICATIONS

Sales Office : **1507, 1st Floor, Nai Sarak, Delhi-110 006**
E-mail: **info@neerajbooks.com**
Website: **www.neerajbooks.com**

Reprint Edition with Updation of Sample Question Papers Only | *Typesetting by:* Competent Computers | *Printed at:* Novelty Printer

Notes:

1. *For the best & up-to-date study & results, please prefer the recommended textbooks/study material only.*
2. *This book is just a Guide Book/Reference Book published by NEERAJ PUBLICATIONS based on the suggested syllabus by a particular Board/University.*
3. *The information and data etc. given in this Book are from the best of the data arranged by the Author, but for the complete and up-to-date information and data etc. see the Govt. of India Publications/textbooks recommended by the Board/University.*
4. *Publisher is not responsible for any omission or error though every care has been taken while preparing, printing, composing and proof reading of the Book. As all the Composing, Printing, Publishing and Proof Reading, etc. are done by Human only and chances of Human Error could not be denied. If any reader is not satisfied, then he is requested not to buy this book.*
5. *In case of any dispute whatsoever the maximum anybody can claim against NEERAJ PUBLICATIONS is just for the price of the Book.*
6. *If anyone finds any mistake or error in this Book, he is requested to inform the Publisher, so that the same could be rectified and he would be provided the rectified Book free of cost.*
7. *The number of questions in NEERAJ study materials are indicative of general scope and design of the question paper.*
8. *Question Paper and their answers given in this Book provide you just the approximate pattern of the actual paper and is prepared based on the memory only. However, the actual Question Paper might somewhat vary in its contents, distribution of marks and their level of difficulty.*
9. *Any type of ONLINE Sale/Resale of "NEERAJ IGNOU BOOKS/NEERAJ BOOKS" published by "NEERAJ PUBLICATIONS" on Websites, Web Portals, Online Shopping Sites, like Amazon, Flipkart, Ebay, Snapdeal, etc. is strictly not permitted without prior written permission from NEERAJ PUBLICATIONS. Any such online sale activity by an Individual, Company, Dealer, Bookseller, Book Trader or Distributor will be termed as ILLEGAL SALE of NEERAJ IGNOU BOOKS/NEERAJ BOOKS and will invite legal action against the offenders.*
10. *Subject to Delhi Jurisdiction only.*

CONTENTS

MANAGEMENT OF MACHINES AND MATERIALS

Question Bank – (Previous Year Solved Question Papers)

Question Paper—Exam Held in February-2021 (Solved)	1-2
Question Paper—June, 2019 (Solved)	1-4
Question Paper—June, 2018 (Solved)	1-2
Question Paper—June, 2017 (Solved)	1-2
Question Paper—June, 2016 (Solved)	1-6
Question Paper—June, 2015 (Solved)	1-2
Question Paper—June, 2014 (Solved)	1-3
Question Paper—June, 2013 (Solved)	1-2
Question Paper—June, 2012 (Solved)	1-9
Question Paper—June, 2011 (Solved)	1-2

S.No. ***Chapterwise Reference Book*** *Page*

OPERATIONS MANAGEMENT: AN OVERVIEW

1. Operations Management: An Overview	1

FACILITIES PLANNING

2. Product Selection	10
3. Process Selection	15
4. Facilities Location	20
5. Facilities Layout and Materials Handling	29
6. Capacity Planning	40

WORK AND JOB DESIGN

7. Work Design	46
8. Job Design	54

S.No.	Chapter	Page
	OPERATIONS PLANNING AND CONTROL	
9.	Planning and Control for Mass Production	61
10.	Planning and Control for Batch Production	71
11.	Planning and Control for Job Shop Production	79
12.	Planning and Control of Projects	86
13.	Maintenance Management	97
	VALUE ENGINEERING AND QUALITY ASSURANCE	
14.	Value Engineering	104
15.	Quality Assurance	111
	MATERIALS MANAGEMENT	
16.	Purchase System and Procedure	116
17.	Inventory Management	129
18.	Stores Management	137
19.	Standardisation, Codification and Variety Reduction	145
20.	Waste Management	150

■■

Sample Preview of the Solved Sample Question Papers

Published by:

NEERAJ PUBLICATIONS

www.neerajbooks.com

QUESTION PAPER

Exam Held in

February – 2021

(Solved)

MANAGEMENT OF MACHINES AND MATERIALS **M.S.-5**

Time: 3 Hours] ***[Maximum Marks: 100***

(Weightage 70%)

Note: *Answer* ***any four*** *questions. All questions carry* ***equal marks.***

Q. 1. ***(a)*** **What is the productibility? How does it affect the product selection?**

Ans. Ref.: See Chapter-2, Page No. 13, Q. No. 7.

(b) **Explain the product design. How does it influence the process design?**

Ans. Ref.: See Chapter-2, Page No. 14, Q. No. 9.

Q. 2. ***(a)*** **Why is 'in process inventory' likely to be higher for an intermittent operation than for a continuous flow operation?**

Ans. Ref.: See Chapter-3, No. 18, Q. No. 4.

(b) **What are the steps of a facility location study? In case you want to locate a soft drink bottling plant, what factor would you consider relevant for taking a location decision?**

Ans. Ref.: See Chapter-4, Page No. 27, Q. No. 7.

Q. 3. ***(a)*** **Service organisations usually have to be provided with a higher capacity than annual or monthly requirement. Why?**

Ans. Ref.: See Chapter-6, Page No. 43, Q. No. 2.

(b) **What is work design? Does work design increase productivity? Justify your answers.**

Ans. Ref.: See Chapter-7, Page No. 46, 'The Work Study Approach: An Overview' and Page No. 48, 'Work Measurement'.

Q. 4. ***(a)*** **Discuss some principles of motion study and their relevance to job design.**

Ans. The goal of motion study is to enhance work performance (quantity and quality of output) through analysis and improvement of body and hand movements. Motion study can be thought of system improvement at a micro level and is a part of human effort engineering.

In the contemporary work environment, motion study also involves reducing the ergonomic stresses associated with a job. This reduces costs (medical treatment and time lost) associated with work injuries. It may also reduce production losses associated with hiring and training replacement workers as well as rehabilitation of persons with work-related injuries.

Principle of Motion Study

Principles relating to movement of human body:

- The labour has to move his/her body with speed for performing a job. Speed of work cannot be increased without moving body properly.
- The use of two hands at a time is also important to increase the speed of work.
- Movement should be reduced for doing all necessary materials, tools, spare parts, etc. has to keep very near to the hands.
- If body movement can be minimized for doing a job, then energy and time will be saved.
- Have to take rest in between works for removing the tiredness, as a result work speed will be increased and total works will be much more.
- To remove monotony, have to arrange recreation and ultimately it will give good result.
- Take care of health and have to arrange first aid that is necessary. Medicines have to keep inside the industry.

The concept of motion economy is concerned with the study of all the motions conducted by the human body to accomplish a task. Motion economy attempts to minimize the number of movements involved in doing a task and do away with all unnecessary movements. Motion economy plays a very important role in appropriately designing a job as it reduces exertion of the body and saves energy and time.

(b) **Critically examine the statement, "Value engineering is more human relation, team building and motivation programme than any thing else."**

Ans. Ref.: See Chapter-14, Page No. 109, Q. No. 6.

Q. 5. ***(a)*** **What are the demand factors and how do they influence the purchase decisions?**

Ans. The demand factors for repeated purchases are usually predictable based on past records and can be ordered from a single vendor on a periodic basis. The demand for non-repetitive single and large volume orders, for example, infrastructure requirements need to be planned and evaluated carefully and proposals or bids are solicited from suppliers which are then evaluated and negotiated. Such demand usually requires a substantial time to be fulfilled.

Demand for items which are of small value and infrequent are usually purchased from small local suppliers and payment is made out of petty cash account.

Demand for all other kinds of requirements is usually met by following the purchase procedure of requisition, quotation soliciting, purchase order, receipt and inspection.

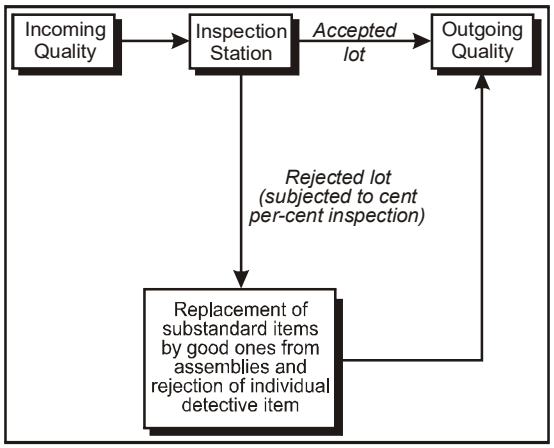
(b) **What do you understand by statistical quality control? Explain the acceptance sampling with suitable diagram.**

Ans. Statistical Quality Control, the use of statistical methods in the monitoring and maintaining of the quality of products and services. One method, referred to as acceptance sampling, can be used when a decision must be made to accept or reject a group of parts or items based on the quality found in a sample. A second method, referred to as statistical process control, uses graphical displays known as control charts to determine whether a process should be continued or should be adjusted to achieve the desired quality.

Acceptance Sampling is a statistical measure used in quality control. It allows a company to determine the quality of a batch of products by selecting a specified number for testing. The quality of this designated sample will be viewed as the quality level for the entire group of products.

A company cannot test every one of its products. There may simply be too high a volume or number of them to inspect at a reasonable cost or within a reasonable time frame. Or effective testing might result in the destruction of the product or making it unfit for sale in some way.

Acceptance sampling solves these problems by testing a representative sample of the product for defects. The process involves first, determining the size of a product lot to be tested, then the number of products to be sampled, and finally the number of defects acceptable within the sample batch.



Q. 6. ***(a)*** **Briefly explain the inventory control. Who should be responsible for inventory control? Why?**

Ans. Inventory Control: The inventory of materials should neither be in excess nor in shortage, but should be maintained at an optimum level so as to avoid increased storage and inventory carrying costs and also to ensure availability and avoid risks associated with shortages.

Inventory control is generally the responsibility of operations department. The stores under the purchase department are also responsible for receiving requisitions and handing the required items to the concerned departments including the operations department. After receiving the materials from the store the operations department should keep a proper tab on the movement of inventories. The top management is responsible for putting in place apt inventory control policies and pertaining to order quantity, reorder point, supplier management, constraints, etc.

The top management is also responsible for checking by exchange curve method or other aggregate methods that whether the inventory policy being followed for a particular category of inventories is suitable or not under the present circumstances.

(b) **What do you understand by automated storage and retrieval? For what kinds of goods, do you think such system would be appropriate?**

Ans. Ref.: See Chapter-18, Page No. 143, Q. No. 9.

■■

Sample Preview of The Chapter

Published by:

NEERAJ PUBLICATIONS

www.neerajbooks.com

MANAGEMENT OF MACHINES AND MATERIALS

OPERATIONS MANAGEMENT: AN OVERVIEW

Operations Management: An Overview

1

INTRODUCTION

All organisations earn their revenue by offering products and/or services for sale. The products, and/or services, that are offered for sale is the output of the organisations. For making the output an organisation requires certain inputs or raw materials and a conversion process to transform the input into the output. The management of the conversion process, which can include transformation, transportation, storing and inspection of inputs, is called operations management. Earlier the subject was called Productions Management. The name was later changed to Operations Management to encompass the study of management of conversion process in the rapidly growing services sector.

CHAPTER AT A GLANCE

SYSTEMS CONCEPTS IN OPERATIONS MANAGEMENT

A system is a collection of objects which are interrelated and interdependent. A system within a bigger system is called a sub-system. A system draws inputs from the environment and converts them into outputs which are again let out in the environment. An organisation can also be viewed as a system as it takes input from the environment in the form of raw materials, labour and capital and converts them into finished products to be sold to consumers. The output of one organisation forms the input of another organisation or household and that is the way a particular organisation is linked with other organisations or households in its environment. Hence, if we take a larger view, an organisation's environment is the system and the organisation is a sub-system. If we take a micro view, the departments within an organisation namely–finance, marketing, MIS, materials, HRD and operations can be all viewed as subsystems of the organisation system. The operations system draws inputs from other departments to convert them into outputs which when converted to money through sales, serves as inputs for all other departments. Inputs can be tangible such as labour or capital or intangible such as information or knowledge. A subsystem influences as well as is influenced by the activities of other subsystems and often functions of subsystems may overlap.

OBJECTIVES IN OPERATIONS MANAGEMENT

The objectives of the operations management systems flow from the corporate objectives and strategies. If the organisation adopts a low cost strategy then the operations department will have to aim for achieving a given output with minimum input. On the other hand if the organisation aims for a differentiation strategy then operations system should aim for flexibility. Whatever the corporate strategy, increasing the productivity, that is the output to input ratio, is always the concern of the operations department. Usually the output is fixed periodically by using forecasting techniques, hence, productivity can be increased by making best uses of inputs or resources

by maximum utilisation of capacity. Efficiency is doing correctly whereas effectiveness is doing the correct things. Increasing the effectiveness that is identifying how things can be done in a better way and implementing them, is also one of the objectives of the firm. Care should be taken that efficiency is increased for doing the correct things and not the incorrect ones. Efficiency should not be increased at the cost of effectiveness. Other objectives of operations can be achieved 100% conformance to predecided standards of quality or raising the conformance level, reducing the time required for the conversion. All these are performance objectives of the organisation. The organisation may also adopt cost control objectives by minimising the explicit and implicit costs.

OPERATIONS MANAGEMENT DECISIONS

Operations management decisions can be discussed in several different ways, which are as follows:

Periodic and Continual Decisions: Periodic decisions are concerned with decisions which have to be taken periodically. Such decisions can pertain to selection, design and updation. Decisions pertaining to selection can be regarding the products, processes, equipments, location, layout, workforce. Decisions pertaining to design can be regarding the design of products, machineries and equipments, jobs, methods, remuneration system, operating and control systems and formulation of various systems and procedures. Decisions pertaining to updation would include modifying the system according to the changes in the environment and on the basis of feedback.

Continual decisions are decisions which have to be taken on a continuous basis. Decisions pertaining to setting of targets, schedules, sequences, maintenance and control of inventory, quality and production, are all covered under continual decisions.

Planning, Organising and Controlling Decisions: Operations management decisions can also be viewed as consisting of planning, organising and controlling decisions. Planning decisions would pertain to the planning of the conversion system and utilisation of the conversion system. Once the conversion process and its utilisation has been planned the need is to take several organising decisions pertaining to staff, work design, standard of production, remuneration, sequencing and structuring of operations etc. Controlling decisions would pertain to control over quantity, quality, time, inventory, cost and maintenance.

Strategic and Operational Decisions: Operations management decisions can also be viewed as comprising of strategic and operational decisions. Strategic decisions are long-term decisions and are decisions which organisations take to meet their aims and objectives taking into account the changing environment. Strategic decisions are difficult to change once taken. Strategic decisions can pertain to selection of product and product design, selection of process, facilities, location and layout, materials handling and capacity planning. The operational decisions are short-term decisions which aid in the fulfilment of the strategic decisions. Operational decisions pertain to production planning, scheduling and control; inventory planning and control, quality control, work and job design, maintenance and cost control.

Operations management decisions need to be reviewed and updated on a periodic basis in order to take into consideration the changes in the environment. Also the conversion system should be monitored on a continuous basis and feedback regarding actual *vs.* planned performance should be utilised to find tune of the conversion process.

TYPES OF PRODUCTION SYSTEMS

There are four types of production systems described as follows:

Production Systems	Description
Mass Production System or Assembly Line	The processing of materials from the input to the output stage takes place in a sequence in a linear flow. Machineries used in mass production system are specific. Mass production system is appropriate for producing high volume low variety outputs. The main problem in a mass production system is line balancing and reducing bottlenecks.

Production Systems	Description
Batch Production System	Batch production system is appropriate for more variety and small volume of outputs. The outputs are produced in batches and stored. The flow of materials from the input to the output stage is not linear. The demand is met out of the inventory of stored outputs. Whenever the inventory level of a certain output falls below a certain level, production for that output is called for. In a batch production system a single machine is used for processing several products. The major problems in a batch production system are designing an optimal layout plan, working out an aggregate production plan, allocation of jobs to machines, determining the optimum inventory level and scheduling and sequencing of operations.
Job Shop	A job shop production system is highly flexible and can accept a vast variety of jobs as according to the demand. The output is of high variety and low volume. Material flow in a job shop from the input to the output stage is non-linear and complex. The processing in a job shop can be carried out on the basis of various criteria or rules. The rule can be shortest processing time, Earliest due date, first come first served etc. The main problem in a job shop production system is deciding the criteria or rule of processing.
Unit Manufacture of Projects	This type of production system is appropriate for manufacturing large sized products such as airplanes or ships. The products cannot be carried to the facilities, hence, the facilities (machineries and manpower) are brought to the product location. The production is undertaken as a project. The project is managed using the concepts of PERT/CPM.

MANAGEMENT OF MATERIALS IN PRODUCTION SYSTEMS

Materials play a very important role in the conversion process. In several industries, materials account for almost 60-70% of the cost of production. Proper management of materials can lead to a cost reduction of 15-20%.

The approaches to materials management are several and all the approaches need to be applied in an integrated manner for achieving the best results. The various approaches to materials management are as follows:

Analysis of the Purchase Price and Value of Materials: An analysis of the purchase price and value of materials can aid in reducing prices and increasing value of purchased materials through better sourcing, better vendor selection etc.

Materials Handling: The production facilities should provide for optimum materials handling. Excessive handling of materials should be avoided but availability of materials should be ensured at the point of requirement. All the required materials handling equipments as well as machineries should be provided for.

Inventory Control: The inventory of materials should neither be in excess nor in shortage, but should be maintained at an optimum level so as to avoid increased storage and inventory carrying costs and also to ensure availability and avoid risks associated with shortages.

Stores Management: The layout of the stores should enable quick and easy access of materials. The store should be well maintained, clean and ventilated to keep wastages at minimum.

Waste Management: Wastes generated at each stage of the conversion system should be analysed and attempted to be reduced if not eliminated. Recycled waste products should be used as inputs as far as possible.

CONCEPTS IN SYSTEMS LIFE-CYCLE

The life-cycle concept holds that all systems pass through four stages which are namely: Introduction, growth, maturity and decline. The operations system comes into existence with the formulation of corporate goals and choice of output and setting up of the operations facility. Teething problems are eliminated in the growth stage and before reaching maturity the system achieves full capacity and economies of scale. After having reached at saturation point there is a decline in growth rate. The organisation needs to now relook its objectives after considering the changes in the external environment and take strategic decisions regarding revival, salvation or starting new business. All decisions including investment decisions pertaining to operations should be taken by considering the entire life-cycle of the system and not only a particular stage.

ROLE OF SCIENTIFIC METHODS IN OPERATIONS MANAGEMENT

Scientific method calls for systematic and objective approach and application of reason and logic to solve problems. The roles of various scientific methods used in operations management are discussed as follows:

Industrial Engineering: It is concerned with creating apt systems of conversion comprising of men, materials, machineries and equipments. In order to create apt conversion systems industrial engineering borrows knowledge from several subjects such as mathematics, physical and social sciences and engineering.

Models: Models can be used for representing real life situations including conversion systems. Models can be mathematical or structural. Structural model can depict a detailed description of the real setup on a reduced scale. Mathematical models provide mathematical relations between various entities of a system. Mathematical models can be used for analysing the real system by filling in the appropriate coefficients.

Computers: Computers help in providing speedier solutions to problems and automating several processes and activities which are repetitive. Computers can be used for data processing, management information, decision analysis and communication purposes.

Behavioural Sciences contribute in designing the appropriate organisation structure, design of work, remuneration and performance appraisal systems.

BRIEF HISTORY OF OPERATIONS MANAGEMENT

A social change in the industrial revolution era which demanded the respect of all citizens and downfall of dictatorships gave birth to classical and behavioural schools of thought that identified factors which motivated people to work. The classical school of thought focused on the technical and scientific aspects while the behavioural school of thought was concerned with the effect of operations on human behaviour.

Following is a brief time line on the evolution of the subject of Operations Management:

1776-1911		
1776	Division of Labour	Adam Smith
1832	Division of labour and assignment of jobs by skills and time study basis	Charles Babbage
1878-1911	Job analysis and job design to increase efficiency and principles of scientific management. The principles mainly described: replacement of thumb's rule by scientific	F.W. Taylor