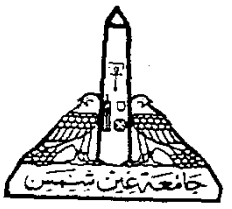

# AIN SHAMS UNIVERSITY
# FACULTY OF ENGINEERING

Department of Design and Production Engineering



## COMPUTERIZED PROCESS PLANNING FOR TURNING OPERATION

Thesis Submitted in Partial Fulfilment of the
Degree of
MASTER OF SCIENCE (M.Sc.)
in
Mechanical Engineering



BY

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B.Sc. Mechanical Engineering

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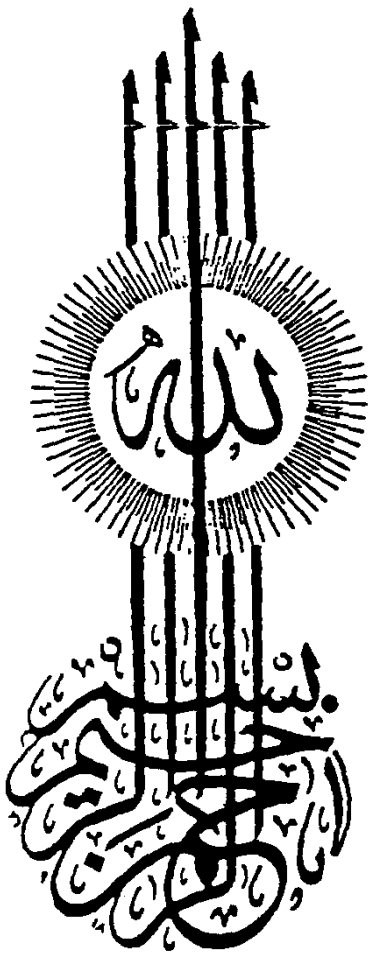

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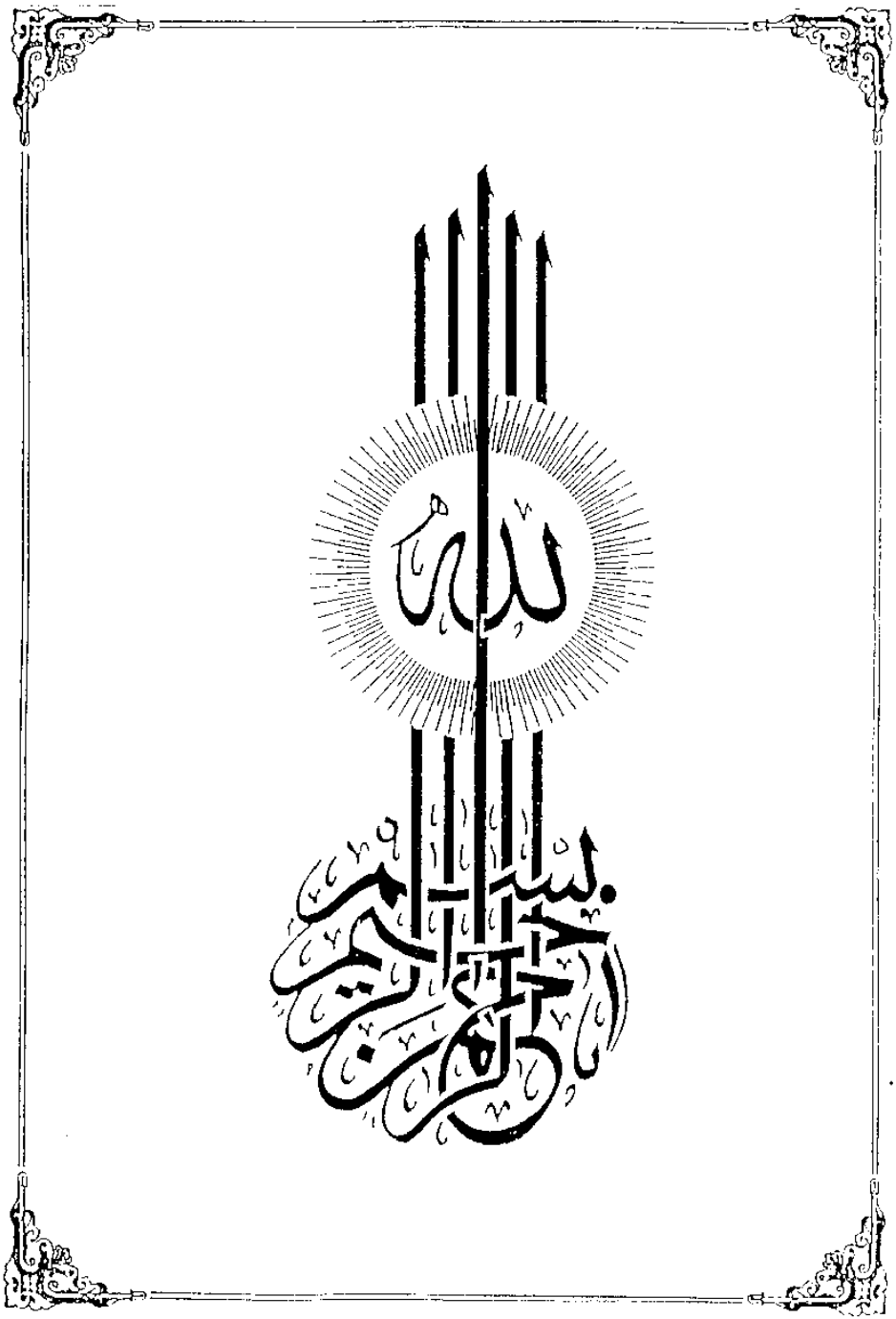

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# SUMMARY

## SUMMARY

Automated process planning has become a basic objective of planning engineers because of the dynamic nature of production systems of industry.

This thesis aims at the design and development of an effective approach to deal with process planning for axially symmetric parts by using computers. The literature has been reviewed to identify approaches and methodologies used in the field with an emphasis on research related to turned parts manufactured on lathe machines. The model which is proposed here consists of three phases.

**Phase (I)** deals with the physical description of axially symmetric components as implied by engineering concepts. Investigation in this phase is concentrated on the establishment of an effective coding system to account for different types of surfaces and how to be presented to the computers. Dimensions, tolerances and surface roughness are considered in connection with different types of turned surfaces such as: cylindrical-,undercut-,taper- groove-,threads holes and knurled surfaces.

**Phase (II)** concerns with automatic arrangement of the proper sequence of operation required to manufacture each surface of the component. The phase consists of some rules of thumb for sequencing the machining operations. An Operation Requirement Matrix (ORM) is constructed by the model to conclude required production of each surface. Raw material size is also obtained in this phase.

**Phase (III)** concerns with detailing of operations. Values of the cutting parameters as feed, speed and depth of cut are determined by using an optimization algorithm. Selection of the machine and tools is also done in this phase. The objective function which is considered is the minimization of the manufacturing cost.

Based on these three phases, a computerized approach is designed and developed. The structure of the approach is based on a number of objectives.

1- to use the type of information as they do exist in industry;

2- to enable users who are not familiar with computers to use the model with minimum effort;

3- to reduce the time and cost associated with the manual preparation of process planning routine

4- to automatically have forms of process planning such as process sheet with detailed information about workpiece - machine - tool combination,

5- to design the computer model on modular bases that have the flexibility to extend the model and/or have it as a step towards building a comprehensive model to other aspects of the production system.

Experimental tests are carried out to ensure that the presented model has the ability to effectively satisfy the objectives stated before. An example part which consists of 20 surfaces* (elements) as implied by the concept of coding in phase (I) is used as an experimental subject. Surfaces of the shaft consists of cylindrical surfaces, taper, form, thread, groove and knurled surfaces.

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* ***The words element and surface have the same meaning throughout the present work.***

The model is further validated by using a variety of turned components* . The NMTURN model can serve well as a first step towards the building of a comprehensive system of computer models of process planning and the production system as a whole.

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* *The words part, component and workpiece also have the same meaning here.*

## ACKNOWLEDGEMENT

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