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AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
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APPLICATION OF COMPUTERS IN FACILITIES MANAGEMENT

Thesis Submitted as Partial Fullfilment of the Degree of
MASTER OF SCIENCE (M.Sc.)

رسالة

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BY

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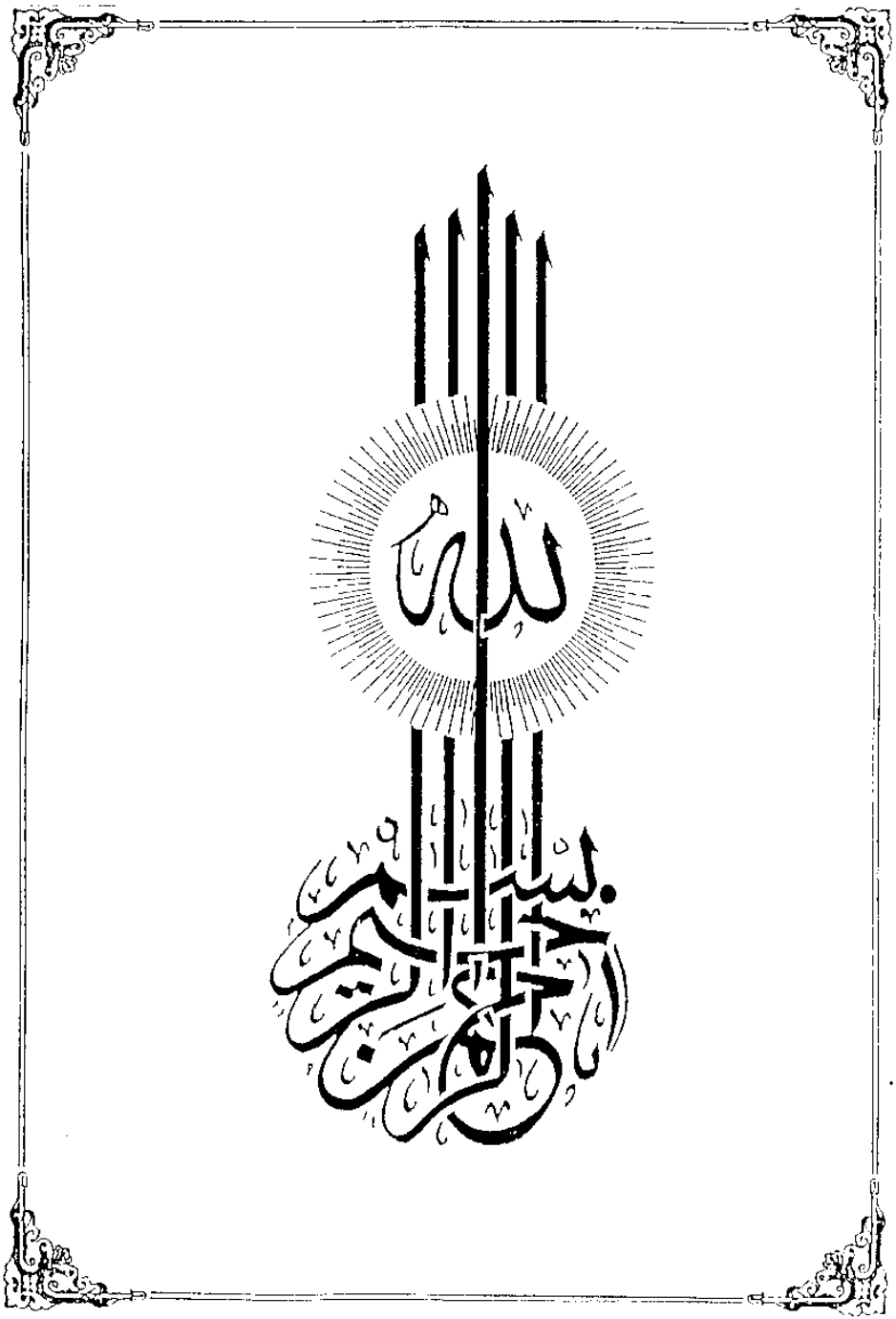

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SUMMARY

The application of computers to the facility layout problem has started twenty years ago. Ever since, efforts have been devoted to promote the efficiency and feasibility of computer techniques to meet the complexity of practical industrial problems.

This thesis has reviewed the facility layout problem with special emphasis on computerized procedures which deal with improving functional layout formats. These formats represent the more complex situations among other layout formats.

The thesis has treated the layout problem through the following stages:

1- Design and implementation of a computerized model using a flow analysis technique to develop the materials flow matrix which represents the inter-facility relationships in terms of the number of loads moving between facilities according to a specific production programme.

2- Design and structure of an optimization routine by which the current layout is tested and evaluated.

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This stage is basically responsible for deriving solutions to the layout problem. The Pair-Wise Exchange methodology was adopted as a simple and effective optimization routine.

3- The analysis of layout features was carried out to identify problems commonly encountered in the application of computers to the layout problems and those required by real life situations. The analysis revealed that the following aspects should be investigated:

a) The problem of the type of distance. Three distance types were considered, namely: linear, rectilinear and real distances. This thesis advocates the consideration of real distances as the other two types involve some approximation. The consideration of real distances has given the chance to include the system of aisles. This feature presents a new concept in computerized approaches.

b) The problem of exchanging facilities with unequal areas. This problem presents the more serious limitation to the application

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of computers. This thesis has established, some decision rules to effectively handle the problem. However, this problem is still unsolved and greatly affects the solution.

c) The problem of fixing facilities in a specific location. This feature is commonly considered by computerized procedures and has been successfully handled.

d) The effect of the existing layout, as a feasible starting solution, on the final solution costs. Different starting solutions were considered.

e) The effect of the facilities configuration on the final solution. This is a new concept in this field. The thesis showed that there is a considerable effect.

4- A more comprehensive computerized model was proposed to account for the findings of previous stages. The model has graphic capabilities and accommodates most of the features actually required by industry.

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The model was tested using a set of experimental procedure and applied to a case study selected from an engineering manufacturing company involved in producing machine tools. The case study had a moderate number of facilities (22 facilities) and a considerable production programme load presented by the flow matrix.

Results of the different runs proved that the developed model runs satisfactorily and is effective in dealing with the problem. Solutions obtained by the model are feasible and require minimum rearrangements to account for other objectives that may be required to consider.

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