AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
IRRIGATION AND HYDRAULICS DEPARTMENT

STUDY OF THE HYDRAULIC CHARACTERISTICS OF FLOW THROUGH RADIAL GATES

BY

AYMAN ABD EL-SATTAR MOKHTAR AHMED
(B.SC. Civil Engineering - Ain Shams University)

A Thesis
Submitted in Partial Fulfillment
of the Requirements for the degree of
MASTER OF SCIENCE
IN CIVIL ENGINEERING

Supervised by

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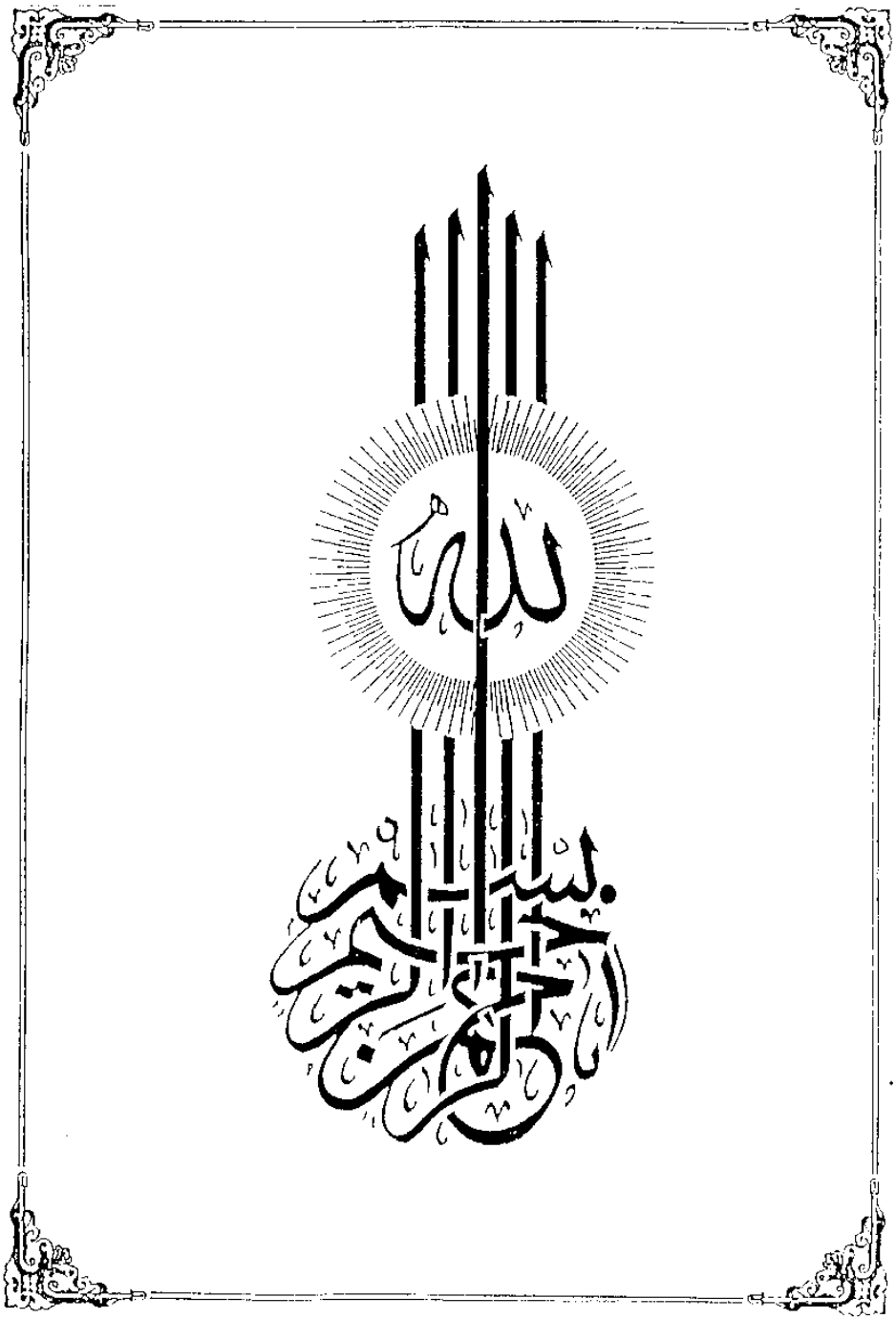

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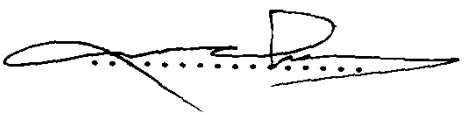

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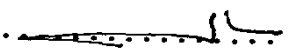

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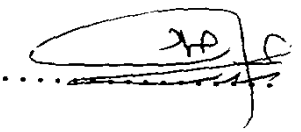

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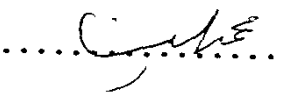

Date: 17/9 / 1994

STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering.

The work included in this thesis was carried out by the author in the department of Irrigation & Hydraulics, Ain Shams University, from December 1992 to August 1994.

No part of this thesis has been submitted for a degree or a qualification at any other University or Institution.

Reprints from this thesis may be made on conditions that the full title of the thesis, name of author, page reference, and date of publication are given.

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ABSTRACT

The present study aims to investigate the relations between the discharge, the gate characteristics, and the water depths (upstream and downstream) to suggest an algorithm for control purposes of radial gates. This algorithm gives mainly the relations between the gate opening, the upstream water depth and the water depth just downstream the gate to keep the discharge constant.

In the theoretical study, dimensional analysis is adopted to investigate the different parameters affecting the discharge, as well as the parameters affecting the gate opening. Also some equations which are needed for the algorithm were deduced in this theoretical study.

Experimental study was carried out in a rectangular reinforced concrete flume in the laboratory of Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University. A model of radial gate with two vents was used to carry out the experimental work.

Results of the experimental data analysis are presented as a series of graphs showing essentially the relations between the water depths at upstream section, downstream section, and just downstream the gate for

constant discharge. These figures are explained analytically using the developed theoretical equations. Also the relations between the pressure head over the gate, the gate opening, and the discharge are presented.

An algorithm is developed giving the equations between the gate opening and its affecting variables. This algorithm can be applied for the automatic regulation of radial gates. The verification of this algorithm is done to measure the accuracy of the developed algorithm.

Design charts are plotted in order to give the gate opening according to the upstream water depth, the water depth just downstream the gate, and the discharge.

Finally, some of the raw data are tabulated in appendix A.

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