AIN SHAMS UNIVERSITY
FACUITY OF ENGINEERING

INFLUENCE OF VARIOUS DESIGN PARAMETERS ON THE PERFORMANCE OF MECHANICAL GOVERNORS IN DIESEL ENGINES

BY
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" A Thesis submitted in partial fulfilment of the requirements of the degree of master of science in mechanical engineering"

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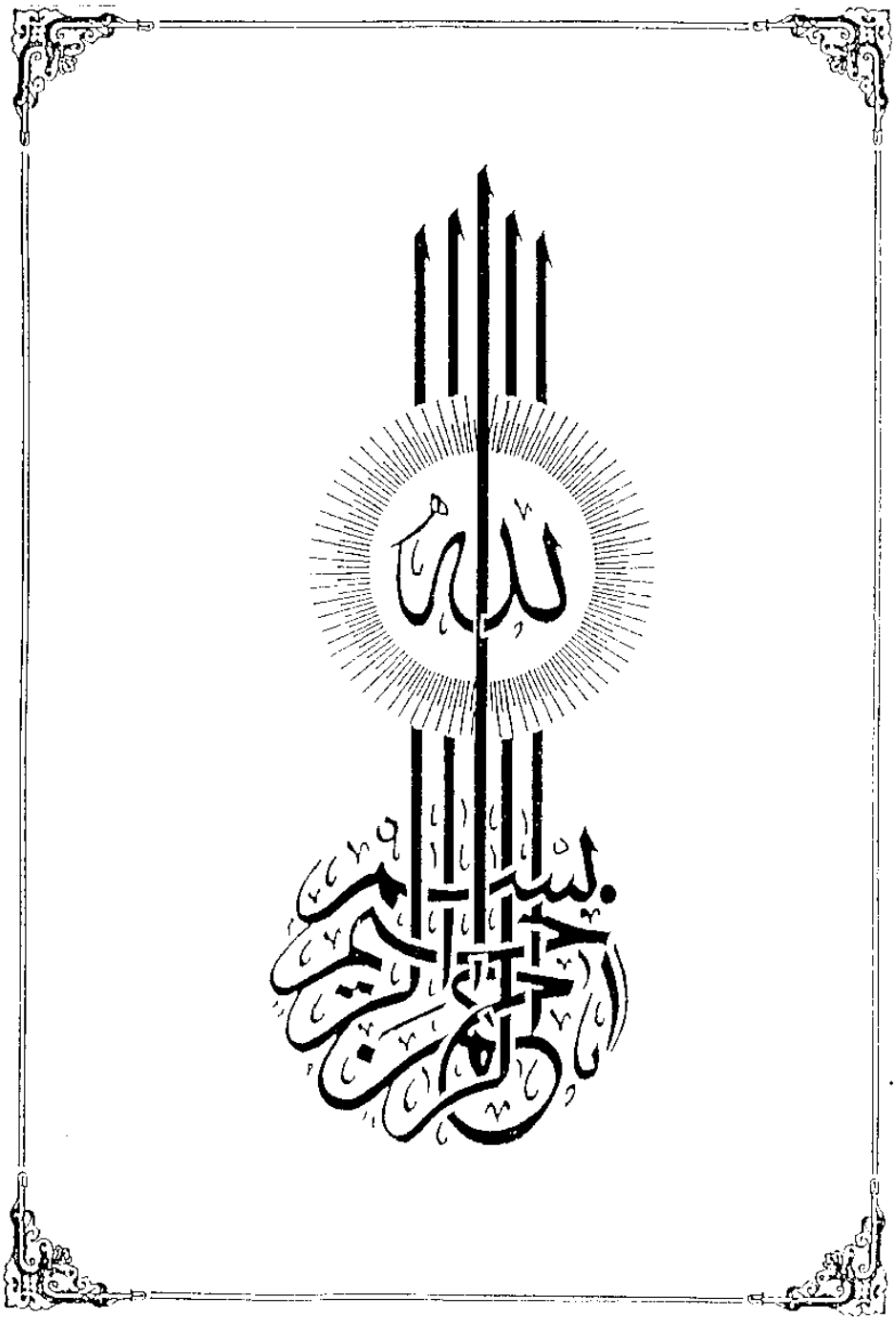

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STATEMENT

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

The work included in this thesis was carried out by the author in the the Department of Energy and Automotive Engineering , Ain Shams University , From November 1985 to Novmeber 1990 .

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

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TO MY PARENTS WHO GAVE AND ARE STILL GIVING

WITHOUT ASKING ANY THING IN RETURN

ABSTRACT

Both static and dynamic behaviour of different mechanical speed governors, as well as, the overall engine-governor system have been investigated. The study shows the effect of various design parameters of the governors on the performance of diesel engine control systems and provides the necessary guide to make the effective compromises so that the governor can be properly designed and selected for a certain engine under a particular application. Computer programs based on the mathematical formulations of the behaviour of different system components were constructed and used to predict the steady-state and transient behaviour of different engine control systems. Simulations of different diesel engines with a certain governor , as well as , simulations of different mechanical governors with a certain diesel engine were made.

Both experimental and theoretical results confirm that the governor characteristics can be altered in several ways to meet a certain opertional requirement ; either by changing the governor weights or by changing the governor springs.

To achieve the optimum performance from a diesel engine control system , the governor parameters must be changed , as

proved by this study. The optimum governor variables are determined from the condition of obtaining the minimum value of an integral performance criteria of the engine control system. To get the optimum performance , governor delay time , viscous friction time , Coulomb friction and degree of irregularity of the governor must be reduced as mentioned in this study. A reduction in degree of irregularity of the governor suppresses the momentary speed rise , but not enough droop may cause instability in a governor operation. Too much droop can result in slow governor response. In case of , PI governor,a reduction in servo time constant and PI element time constant would improve the transient performance of diesel engine control systems.

At low engine time constant , the transient performance is improved , but the speed governing characteristic is in a worse operating conditions.

This study shows , for example , that an improvement of about 10.6% or 10% in the momentary speed rise can be achieved by either reducing the governor delay time or the servo time constant by 25% provided that all optimum parameters are implemented.

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