سامية محمد مصطفى

شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

سامية محمد مصطفى

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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سامية محمد مصطفى

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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سامية محمد مصطفى

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

سامية محمد مصطفى

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بالرسالة صفحات لم ترد بالأصل

Evaluation of Ramp Metering Strategies in Greater Cairo

A Thesis
Submitted to Faculty of Engineering
Ain Shams University in Fulfillment of the Requirement for M. Sc. Degree in Civil Engineering
(Transportation Planning and Traffic Engineering)

Prepared by

Salma Hussein Mohammed Abu-Bakr
B.Sc. in Civil Engineering, June 2014
Faculty of Engineering, Ain Shams University

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Cairo, 2019

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Statement

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of M. Sc. in Civil Engineering.

The work included in this thesis was carried out by the author in the Department of Public Works, Faculty of Engineering, Ain Shams University, from 2016 to 2019.

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

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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ABSTRACT

Uncontrolled on-ramp merging section is considered as bottleneck sections that causes severe traffic congestions at several locations on urban expressways in Greater Cairo Region (GCR). Ramp metering control strategy, which aims to regulate the entry of on-ramp vehicles onto the mainline, has proved several benefits in improving the traffic performance and safety on many freeways and expressways around the world. However, no studies have been conducted to assess the impacts of implementing such strategy on GCR roads network. Accordingly, the aim of this thesis is to examine the effects of applying ramp metering control system on urban expressways in GCR.

Four on-ramp sites with different geometric configurations were selected along the 6th of October corridor and the 15th of May corridor as a case study. The evaluation process was conducted based on the microsimulation methodology by using Vissim software package. The developed simulation models were calibrated and validated by using the traffic data collected during peak hours at the selected sites. Two different control strategies were tested at each site: fixed-time ramp metering strategy and fixed-time ramp signals integrated with mainline signals. The both two strategies were compared to "no control" condition and evaluated based on three different performance measures; average speed, average vehicle delay, and on-ramp queue length.

The results of the microscopic models indicated that implementing fixed-time ramp metering control strategy showed significant improvement in the traffic performance on the whole system (i.e., ramp and mainline traffic). However, fixed-time ramp metering control showed negative impacts on the traffic performance on the on-ramp. Therefore, the optimum signal timing was selected based on the reduction in the whole system delay. At three sites, fixed signal timing scenario with cycle length of 10 seconds and allow one car to enter per green was found to be the best scenarios in reducing the average vehicle delay on the whole system and mainline segments regardless the on-ramp queue length, although their different geometric configurations. It improved the overall traffic performance at site-1 by