Simulation of Queueing Systems
Using Pascal Language

A Research Submitted for Partial Fulfillment for The Degree of M.Sc in Statistics.

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DEDICATION
To my parents.

To my brothers and sisters.

To my grandmother.

To my friends.

To all whom I love...
ACKNOWLEDGEMENT

First of all I would like to thank Allah for providing me the strength and ambition to fulfill this study. Thanks also are directed to my supervisor Dr. Hamed Humida Ahmed for his valuable advice and assistance throughout the whole time spent in writing this research. Really his assistance has boosted me with courage to exert more efforts in my study. I am grateful to all those who stood beside me and gave me support to bring this work.

ABSTRACT
The aim of this study is to formulate models that can be used to simulate the behavior of queueing systems in order to know the range of the efficiency of service centers to offer service in short time with least cost. To achieve this aim the researcher has designed programs using Pascal Program Language. These programs make use of the previous data taken from the system (inter arrival times and service time of units and it’s probabilities or it’s probability distribution). Then the user must enter the number of customers whom the user want to simulate. Here this programs calculate the cumulative probabilities of these times, after that the programs generate the random numbers which imitate these times. Then it is possible to know the time of arrival for each unit, service time, time service begin, time service end, time spent by units in the queue, also these models calculate the average of waiting time.

The advantages of these programs can be summarized as following:
- To facilitate the system study behaviour in the long run in short time.
- Minimizing effort and cost.
- Calculating the measurements special for queueing system.
- Establishing a basement for decision makers to depend on concerning the system.

الخلاصة
الهدف الأساسي لهذه الدراسة هو توفير نماذج يمكن من خلالها محاكاة سلوك صفوف الانتظار للتعرف على مدى كفاءة أو فعالية مركز أو مراكز تقديم الخدمة في أقصر وقت بأقل تكلفة. ولتحقيق هذا الهدف قام الباحث بتصميم برامج باستخدام لغة الباسكال. تقوم هذه البرامج بالاستفادة من البيانات السابقة للنظام (الأزمان بين الوصول والوصول السابق له و زمن تقديم الخدمة لكل وحدة مع احتمالاتها أو توزيعه الاحتمالي). بع ذلك يجب على المستخدم إدخال عدد الوحدات التي يريد محاكاة سلوك النظام عنها، عندها تقوم هذه البرامج بحساب الاحتمالات التجميعية المنتظرة لهذه أزوار ثم توليد الأرقام العشوائية التي تقوم بمحاكاة هذه الأزمان. بعد ذلك يمكن معرفة أزوار الوصول لكل وحدة و زمن بداية الخدمة و زمن الخدمة و زمن نهاية الخدمة والزمن الذي تقضيه الوحدة في صف الانتظار ومن ثم تتمكن هذه النماذج من حساب متوسط زمن الانتظار.

ويمكن تلخيص ميزة هذه البرامج في الآتي:

- تتيح دراسة سلوك النظام على المدى الطويل في وقت قصير.
- اختصار الجهد والتكلفة.
- حساب المقابل الخاصة بصفوف الانتظار.
- توفير قاعدة لتخذي القرار يتم الاعتماد عليها فيما يختص بالنظام.
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