UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

A STUDY ON SINGLE SERVER AND MULTI SERVER FUZZY QUEUING MODEL AND QUEUING THEORY MODEL

P13M19

MUHAMMAD ALIF HAIKAL BIN NOR AZMAN (2017412328)

NURUL LATIFAH BINTI RAMLI (2017412434)

NURAZIMAH BINTI MAHARUDIN (2017412416)

Report submitted in partial fulfilment of the requirement

for the degree of

Bachelor of Science (Hons.) (Management Mathematics)

Faculty of Computer and Mathematical Sciences

JULY 2019

AKNOWLEDGEMENT

First and foremost, we are very grateful to the Almighty ALLAH S.W.T for letting us to finish our final year project. We are also glad that we can finish our project on time with ease.

Here, we wish to express our sincere appreciation to our supervisor Madam Noor Hidayah Binti Mohd Zaki for encouragement, guidance, suggestions and critics throughout finishing this project. We are also thankful for every kindness that she gave to us throughout these two semesters.

Special thanks to the managers for both cinemas which are TGV Cinemas Aeon Seremban 2 and GSC Cinemas Palm Mall Seremban for giving us the permission to observe the system for the food counter in each cinema. We are thankful for the kindness and help from the staffs of both cinemas.

Most importantly, special thanks also to our family and friends for their external supports to finish this project. Without their supports we cannot finished our project on time.

TABLE OF CONTENT

AKNOWLEDGEMENT i
LIST OF FIGURES iv
LIST OF TABLES iv
ABSTRACT v
CHAPTER ONE 1
1.0 INTRODUCTION 1
1.1 NATURE 1
1.2 PROBLEM STATEMENTS 3
1.3 RESEARCH OBJECTIVES 3
1.4 SIGNIFICANCE AND THE BENEFIT OF THE PROJECT 3
1.5 SCOPE OF THE PROJECT 4
1.6 DEFINITION TERMS AND CONCEPT 4
CHAPTER TWO 7
2.0 BACKGROUND THEORY AND LITERATURE REVIEW 7
2.1 BACKGROUND THEORY 7
2.1.1 Queuing Theory Model 7
2.1.2 Fuzzy Queuing Theory 8
2.2 LITERATURE REVIEW 9
2.2.1 Fuzzy Queuing Theory 9
2.2.2 The differences between Fuzzy Queuing Model (FQM) with Queuing Theory Model (QTM). 10
2.2.3 Application of Queueing Theory. 11
CHAPTER THREE 13
3.0 METHODOLOGY AND IMPLEMENTATION 13
3.1 CHARACTERISTIC OF QUEUING SYSTEM 13
3.1.1 System 13
3.1.2 The arrival pattern in the system 13
3.1.3 Service rate in the system 13
3.1.4 The Queue Discipline 13
3.1.5 System Capacity 13
3.1.6 Queue behaviour 13
3.2 METHODOLOGY 14
3.3 FLOW IN COMPUTING PERFORMANCE MEASURES OF QUEUING THEORY AND FUZZY QUEUING MODEL 18

3.3.1 Analyze Input Parameter 19
3.3.2 Queuing Theory Model 19
3.3.3 Fuzzy Queuing Model 21
CHAPTER FOUR 26
4.0 IMPLEMENTATION 26
4.1 CALCULATION FOR ARRIVAL RATE, λ AND SERVICE RATE, μ 26
4.1.1 Arrival rate, λ and service rate, μ for single server 26
4.1.2 Arrival rate, λ and service rate, μ for multi-server 27
4.2 CALCULATION FOR PERFORMANCE MEASURES OF QUEUING THEORY MODEL 28
4.2.1 Calculation for performance measures of Queuing Theory Model for Single server 28
4.2.2 Calculation for performance measures of Queuing Theory Model for Multi server 29
4.3 CALCULATION FOR PERFORMANCE MEASURES OF FUZZY QUEUING MODEL 31
4.3.1 Calculation for steps in DSW Algorithm and performance measures of Fuzzy Queuing Model for Single server 31
4.3.1.1 Calculations for steps in DSW Algorithm for single server 31
4.3.1.2 Calculation for performance Measures of Fuzzy Queuing Model for single server 36
4.3.2 Calculation for steps in DSW Algorithm and performance measures of Fuzzy Queuing Model for Multi – Server 37
4.3.2.1 Calculation for steps in DSW Algorithm for multi-server. 37
CHAPTER FIVE 45
5.0 RESULTS AND DISCUSSION 45
5.1 PERFORMANCE MEASURES FOR QUEUING THEORY MODEL 45
5.1.1 Performance measures for single server 45
5.1.2 Performance measures for multi-server. 46
5.2 PERFORMANCE MEASURES OF FUZZY QUEUING MODEL USING DSW ALGORITHM 47
5.2.1 Single server 47
5.2.2 Multi-server 49
CHAPTER SIX 53
6.0 CONCLUSION AND RECOMMENDATION 53
REFERENCES 54

ABSTRACT

People always need to face with a long queue and waiting for a long time to be served. Usually, in the peak hours such as 12 p.m. until 2 p.m., 6 p.m. until 10 p.m. are always full of people and the long queue continues until the peak hours end. It can lead to dissatisfaction of customers. By comparing Fuzzy Queuing Model and Queuing Theory Model which model is the best model to get the better service performance. The purpose of this study is to investigate the service performance of cinema using fuzzy queuing model. This study suggests several research objectives to be attained which are to compute service performance using Fuzzy Queuing Model for single server and multi-server. Other than that, is to compare service performance between Fuzzy Queuing Model and Queuing Theory Model. The method that we used in this study are Queuing Theory Model and Fuzzy Queuing Model which is DSW algorithm to get the required variables. The data was collected manually at GSC Cinemas Palm Mall Seremban and TGV Cinemas, Aeon Seremban 2. The values of arrival rate, λ and service rate, μ were obtained by calculation with using Queuing Theory Model and Fuzzy Queuing Model. For future observation, other researcher can compare single server for both methods to know which method the best method in maximize the service performance and minimize the service time.

Keywords: Queuing Theory Model, Fuzzy Queuing Model, DSW Algorithm, Multi-server and Single-server queuing system.