STUDY AND RELIABILITY ANALYSIS OF STANDBY SYSTEMS WITH SOME APPLICATIONS

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English Summary

Reliability, availability and maintenance have become more significant in recent years due to the large number of competitors in services, growing needs and overall operating costs.

Markov Models are some of the most powerful tools available to engineers and scientists for analyzing complex systems. This analysis yields results for both the time dependent evolution of the system and the steady state of the system. Markov Model analysis can yield a variety of useful performance measures describing the operation system. These performance measures include the system availability, mean time to system failure and many other measures.

Redundancy is the most important method supporting reliability. It is defined as duplication of components or repetition of operations to provide alternative functional channel in case of failure. Redundancy can be implemented in different ways: structural (cold and standby redundancy), temporal, functional, etc. Application of redundancy is always connected with an increase in cost and/or complexity as well as sometimes with organization problems. Standby is the most important type of redundancy that has been widely applied to improving system reliability and availability in system design.

The standby redundancies include cold, warm and hot standby. Cold standby means units will never fail in the standby state; warm standby means the standby can fail with a failure rate lower than the working units; the hot standby stands for the standby unit fails with the same failure rates as the working units. In this thesis we focused on Cold standby system only.

On the other hand, Software reliability is one of the key tasks for any software industry. Achieving Software reliability is hard because the complexity of software tends to be high. As the cost of software application failures grows and as these failures increasingly impact business performance, software reliability will become progressively more important. Employing effective software reliability engineering techniques to improve product and process reliability would be the industry's best interests as well as major challenges.

When the requirements for and dependencies on software increase, the probability of crises from failures increase. These failures of software can often cause effects which range from inconvenience such as (Malfunction of home appliances), Economic damage such as (Interruptions of banking system) and Loss of lives such as (Medical software or Failure of flight system) .

This thesis consists of six chapters which can be summarized as follows:

Chapter (1) presents background, some basic concepts related with the thesis, Markov models and mathematical techniques to solve first linear differential equations. Also, this chapter presents literature review for Hardware Reliability, Software Reliability and literature review associated with making comparison between Hardware Reliability and Software Reliability.

Chapter (2) is devoted to apply Kolmogorov's forward equations method to characterize, solve the system equations and then evaluate the availability,

mean time to system failure and cost analysis for Two-Dissimilar-Unit Cold Standby System with three States under Human Failure.

Chapter (3) illustrates applied Kolmogorov's forward equations method to characterize, solve the system equations and then evaluate the availability, mean time to system failure and cost analysis for two- unit cold standby repairable redundant system involving common-cause failures and preventive maintenance.

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Chapter (4) concerns on applied Kolmogorov's forward equations method to characterize solve the system equations and then evaluate the availability, mean time to system failure and cost analysis for 2-out-of-3 repairable redundant system involving Preventive Maintenance

Chapter (5) center of attention on applied Laplace transform technique to evaluate the availability, Reliability, mean time to system failure and cost analysis for two-similar-Unit Cold Standby System under human failure.

Chapter (6) focuses on Reliability estimation and analysis of DDL MYSQL server for two operating systems Windows and Linux by using Generalized Gamma Distribution and Weibull Distribution.

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Chapter (7) gives an idea about the conclusions of this thesis and suggestions for future work.