One of the field of theoretical computer science is the study of the network using graph theoretical models. An example of such networks are scale-free networks. Their concept raised in recent years a lot of interest, because many real networks have scale-free features (Internet router-level, network co-operation in science and art, etc.).

The aim of the dissertation is an analysis of these networks. History, model, basic properties and examples of scale-free networks are described in the first chapter.

The important part of the dissertation are theoretical results (theorems, lemmas, etc.) which concern basic security problems in scale-free networks. In the second chapter is considered the connectivity of scale-free graphs, namely the isolating vertex problem.

One of primary properties of scale-free networks is the power-law degree distribution. This means that the probability that a randomly selected vertex has a degree k follows the distribution:

$$p(k) \sim k^{-\gamma}.$$

The correct calculation of the γ parameter in empirical networks is not so easy. There are several methods to estimate the γ parameter, but each of them has some defects. In the third chapter are presented methods used so far. In the subsection 3.3 is presented the new method based on previous methods but eliminating their defects.

Scale-free networks are used in the real world, e.g. to forecasting stock prices in financial markets. The fourth chapter deals with this problem. Stock market models, which have properties of scale-free graphs, are described.

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