CHAPTER I

INTRODUCTION

A graph G is a couple $(X, \mathcal{E})$, where X is a set and $\mathcal{E}$ is a set of 2-subsets of X. The elements of X and $\mathcal{E}$ will be refered to as vertices and edges respectively. By the degree of a vertex v we mean the number of edges that contain v. Havel and Hakimi [4], as cited in [1], give a necessary and sufficient condition for the existence of a graph with prescribed degrees. A sequence $x_1, E_1, x_2, E_2, \ldots, E_q, x_{q+1}$ in which $x_k, x_{k+1} \varepsilon E_k$ for $k = 1,2,\ldots,q$ is called a walk from x_1 to x_{q+1}. A cycle is a walk $x_1, E_1, x_2, \ldots, E_q, x_{q+1}$ in which $x_i \neq x_{i+1}$ and all the edge and all the vertices are distinct except $x_1 = x_{q+1}$. A graph is said to be connected if for any pair of distinct vertices u, v there exists a walk from u to v. A graph G is acyclic if G contains no cycles. A tree is a connected acyclic graph. Necessary and sufficient conditions for existence of connected graphs and trees with prescribed degrees are also known. They can be found in [2].

In the definition of a graph, if we take $\mathcal{E}$ to be a set of r-subsets of X, we obtain what is called r-graph. Hence the concept of an r-graph is a generalization of a graph. It is natural to look for necessary and sufficient conditions for existence of an r-graph, a connected r-graph and an r-tree with prescribed degrees. In [3], Dewdney give a necessary and sufficient condition for the existence of an r-graph with prescribed degrees.

The purpose of this study is to find necessary and sufficient conditions for the existence of connected r-graphs and r-trees with prescribed degrees.

Chapter II deal with well known results on hypergraphs which are essential for our work. Chapter III deal with degree sequence of hypergraphs. To make this thesis self contained we include a proof of Dewdeny's theorem. The result of our investigation are given in chapter IV and V. In chapter IV we give a characterization of an r-tree and a necessary and sufficient condition for a finite sequence of non-negative numbers to be a degree sequence of an r-tree, while a necessary and sufficient condition for a given finite of non negative numbers to be a degree sequence of connected r-graph is given in chapter IV.