ABSTRACT

Our investigation in the thesis entitled "**A STUDY ON THE APPLICATIONS OF IMPRECISE NUMBERS**" consists of eight chapters.

Chapter 1 is introductory in nature to discuss the basic and the brief history regarding the development of imprecise numbers. Motivation and the investigation of imprecise numbers presented in the later chapter are described in the light with related work of other authors. Definition of the imprecise number used in the later chapter from the earlier author is presented in the preliminary section.

In Chapter 2 entitled "A Few Applications of One-dimensional Imprecise Numbers", we have discussed the properties of one-dimensional imprecise number occurred under intersection and union operation. Properties are collected from the classical set theory to declare the imprecise numbers has the similar character with the classical set which can represent all membership element lies between 0 and 1 in a single set.

If an imprecise number $N = [\alpha, \beta, \gamma]$ is associated with a presence level indicator function,

$$\rho_X(x) = \begin{cases} \rho_1(x), & when\, \alpha \le x \le \beta \\ \rho_2(x), & when\, \beta \le x \le \gamma \\ 0, & otherwise \end{cases}$$

With a constant reference function 0 in the entire real line such that $\rho_1(x)$ is continuous and non-decreasing in the interval $[\alpha, \beta]$ and $\rho_2(x)$ is a continuous and non-increasing in the interval $[\beta, \gamma]$.

Case I: If $\rho_1(\alpha) = \rho_2(\gamma) = 0$ and $\rho_1(\beta) \neq \rho_2(\beta)$, then we call it subnormal imprecise number.

Case II: If $\rho_1(\alpha) = \mu_2(\gamma) = 0$ and $\rho_1(\beta) = \rho_2(\beta) = 1$, then we call it normal imprecise number.

Each element of the classical matrix is expressed in the form of the imprecise number to obtain imprecise matrix. Thus, matrix related problems with complexity in nature are represented in the imprecise matrix in this chapter so that their decomposition and separation behaviors can be studied with different imprecise matrix properties. Properties of imprecise matrix occurred under Arithmetic operations of addition and subtraction are used to solve some of the complex transportation problems.

In Chapter 3, we have represented the two-dimensional complex problems in the two-dimensional imprecise numbers. Properties of the classical theory under the operation of intersection and unions are proposed in the two-dimensional imprecise numbers to declare that the two-dimensional imprecise numbers can be extendable from one-dimensional imprecise numbers having a similar character with classical set theory and are proved with examples. Two-dimensional imprecise numbers model is introduced to solve the two variables containing complex economic problems at the end of this chapter.

In chapter 4 entitled "Three-dimensional imprecise numbers and its applications", we have represented three-dimensional complex problems into three-dimensional imprecise numbers. Properties of three-dimensional imprecise numbers under the operations of union and intersection occurred in classical set theory are discussed with examples. For this reason, the structure of union and intersection of the three-dimensional numbers is represented with own notation in section 4.3. of this chapter. To discuss the complex problems of three variables a three-dimensional imprecise number model is introduced at the end of this chapter.

In Chapter 5 entitled "Introduction of N^{th} dimensional Imprecise Numbers", we have introduced the definition of N^{th} dimensional imprecise numbers with notation. Structure of intersection and the union is defined with maximum and minimum operators to study the properties of N^{th} dimensional imprecise numbers.

In chapter 6 entitled "Construction of Normal Imprecise Function", we have used the definition of imprecise number to obtain an imprecise function. To be an imprecise function we must have some basic properties and are proposed at the beginning of this chapter. Any function can be transformed into an imprecise function form with the help of multiplication factors and are discussed in other section of this chapter. The condition for the rate of convergence of imprecise function properties is discussed for the different imprecise functions. It is a value for which an imprecise function is optimally applicable in a particular place.

In chapter 7 entitled, "Rate of Convergence of the Sine Imprecise Function", we have discussed the method for construction of sine imprecise function from the general function. For this reason, a polynomial of degree one, two and the exponential functions are considered in this chapter. A particular data collection of points is considered as an example for the construction of sine imprecise function. Conversion point of the various sine imprecise functions is also discussed. Using imprecise numbers definition, the area formula of sine imprecise function is expressed in the summation form.

In general $y^* = (c_0 + c_1x + c_2x^2 + c_3x^3 + \cdots \ldots\ldots + c_nx^n)\sin(lx)\,; l\epsilon Z$ is a sine imprecise function.

Depending on the value of **"n"** and **"l",** we wet different sine imprecise functions. For this reason, we get different graphs having different conversion points and different area formulae of sine imprecise functions.

In chapter 8, we have discussed the method for construction of cosine imprecise function from the general function. For this study, a polynomial function of degree one and two are considered in the chapter. The cosine function is used as a multiplier to obtain cosine imprecise function. A particular data collection of points is considered as an example for the construction of different cosine imprecise function. Conversion points of the various cosine imprecise functions are also discussed. Using imprecise numbers as the limits of integration the area formula of cosine imprecise function is obtained in the summation form.

In general $y^* = (c_0 + c_1x + c_2x^2 + c_3x^3 + \cdots \ldots\ldots + c_nx^n)\cos(lx)\,; l\epsilon Z$ is a cosine imprecise function.

Depending on the value of **"n"** and **"l"** we get different cosine imprecise functions. For this matter, we get different graphs to have different conversion points with different cosine imprecise functions formulae.