List of Notations and Abbreviations

FS	Fuzzy Set
IVFS	Interval Valued Fuzzy Set
IFS	Intuitionistic Fuzzy Set
NS	Neutrosophic Set
SVNS	Single Valued Neutrosophic Set
TFS	Temporal Fuzzy Set
TIFS	Temporal Intuitionistic Fuzzy Set
PFS	Pythagorean Fuzzy Set
SFS	Spherical Fuzzy Set
PNS	Pythagorean Neutrosophic Set
NSS	Neutrosophic Spherical Set
FNS	Fermatean Neutrosophic Set
FTNS	Fermatean Temporal Neutrosophic Set
IVFNS	Interval Valued Fermatean Neutrosophic Set
FNCS	Fermatean Neutrosophic Cubic Set
PNT	Pythagorean Neutrosophic Topology
PNP	Pythagorean Neutrosophic Point
PNTS	Pythagorean Neutrosophic Topological Space
PNN	Pythagorean Neutrosophic Neighbourhood
PNOS	Pythagorean Neutrosophic Open Set
PNCS	Pythagorean Neutrosophic Closed Set

NST	Neutrosophic Spherical Topology
NSTS	Neutrosophic Spherical Topological Space
NSP	Neutrosophic Spherical Point
NSN	Neutrosophic Spherical Neighbourhood
NSOS	Neutrosophic Spherical Open Set
NSCS	Neutrosophic Spherical Closed Set
FNT	Fermatean Neutrosophic Topology
FNTS	Fermatean Neutrosophic Topological Space
FNP	Fermatean Neutrosophic Point
FNN	Fermatean Neutrosophic Neighbourhood
FNOS	Fermatean Neutrosophic Open Set
FNCS	Fermatean Neutrosophic Closed Set
BT-FN_S	Bitopologies of Fermatean Neutrosophic Set
BT-FN_{Subs}	Bitopologies of Fermatean Neutrosophic Subsets
FTNS	Fermatean Temporal Neutrosophic Set
FNGO	Fermatean Neutrosophic Gradation of Openness
FNGC	Fermatean Neutrosophic Gradation of Closedness
gp- map	Gradation preserving map
I_n-BTF	Category of all-inclusive BT-FN_{Subs} and continuous functions
FNr-top	Category of r^{th} graded FNTSs and gp-maps
FT-NTS	Fermatean Temporal Neutrosophic Topological Spaces
SFT-NT	Fermatean Temporal Neutrosophic Topology in **Šostak's** sense
CFT-NT	Fermatean temporal neutrosophic topology in **Chang**'s sense

LFT-NT	Fermatean Temporal neutrosophic topology in **Lowen**'s sense
FTN- closed	Fermatean Temporal Neutrosophic closed
FTNRS	Fermatean Temporal Neutrosophic Rough Set
FNRAS	Fermatean Neutrosophic Rough Approximation Space
FN-r	Fermatean Neutrosophic relation
LT	Linguistic Term
MCDM	Multi-Criteria Decision-Making
CODAS	Combinative Distance-Based Assessment
ĐϺ	Decision Maker
SWAM	Spherical Weighted Arithmetic Mean
SWGM	Spherical Weighted Geometric Mean
FWAM	Fermatean Weighted Arithmetic Mean
FWGM	Fermatean Weighted Geometric Mean
D-Mx	Decision Matrix
NS D-Mx	Neutrosophic Spherical Decision Matrix
FN D-Mx	Fermatean Neutrosophic Decision Matrix
PIS	Positive Ideal Solution
NIS	Negative Ideal Solution
SF	Score Function
AC	Accuracy Function
TMNSDM	Tangent Metric Neutrosophic Spherical Distance Measure
TMFNDM	Tangent Metric Fermatean Neutrosophic Distance Measure
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution

ED	Euclidean distance
N-ED	Normalized Euclidean Distance
HD	Hamming Distance
N-HD	Normalized Hamming Distance
SMSVND	Sine Metric Single- Valued Neutrosophic Distance

ABSTRACT

The scope of this thesis is to explore some of the existing neutrosophic variants and introduce some new types of neutrosophic variants. The notion of extended Pythagorean neutrosophic set, neutrosophic spherical set, and Fermatean neutrosophic set has been examined and the concepts of topology, rough set, operators, and measures has been developed and analysed. The idea of the proposed logic is extended to define Fermatean neutrosophic cubic set to manage high levels of uncertainty and vagueness and also to introduce Fermatean temporal neutrosophic set to deal with time moments. Further, the thesis combines rough set concept with Fermatean temporal neutrosophic set to construct a new class of rough set called Fermatean temporal neutrosophic rough set. A new class of aggregation operators for neutrosophic variant has been developed and used in a **CO**mbinative **D**istance-based **AS**sessment (**CODAS**) evaluation method. Furthermore, tangent metric neutrosophic spherical distance measure and tangent metric Fermatean neutrosophic distance measure are formulated and applied to the **T**echnique for **O**rder **P**reference by **S**imilarity to **I**deal **S**olution (**TOPSIS**) method. Illustrative examples have been provided to validate and compare the defined aggregation operators and distance measures.