

A Study of Distributive and Multiplication N-groups in Near-rings and their Fuzzy Aspects

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
FOR THE DEGREE OF**

**DOCTOR OF PHILOSOPHY
IN
MATHEMATICS**

To



THE ASSAM

ROYAL GLOBAL UNIVERSITY

By

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June, 2024

DECLARATION

I hereby declare that the content embodied in the PhD thesis entitled "**A study of Distributive and Multiplication N-groups in Near-rings and Their Fuzzy Aspects**" is the result of research work carried out by me in the Department of Mathematics, **The Assam Royal Global University, Guwahati, India**, under the supervision of Prof.(Dr.) Anuradha Devi and co-supervision of Dr. Navalakhi Hazarika.

In keeping with the general practice of reporting research observations, due acknowledgments have been made wherever the work described based on the findings of other researchers.

Further, I declare that this thesis as a whole or any part thereof has not submitted to any university (or institute) for award of any degree or diploma.

Date: 21/06/2024

Place: Guwahati

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Dedicated to my parents

CERTIFICATE FROM THE SUPERVISORS

This is to certify that the work presented in the thesis entitled "*A Study of Distributive and Multiplication N-groups in Near-rings and Their Fuzzy Aspects*" by **Md Nazir Hussain**, submitted to the Assam Royal Global University for the award of the degree of **Doctor of Philosophy in Mathematics**, is a record of the results obtained from the research work carried out under our supervision.

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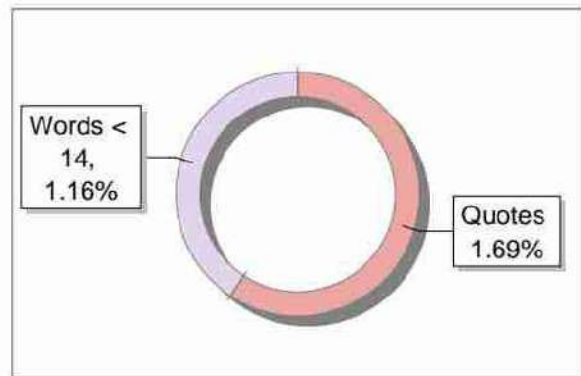
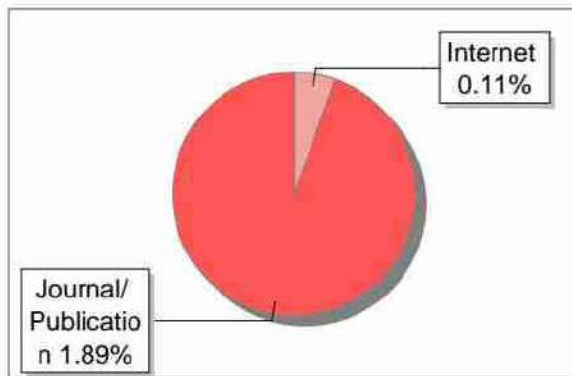
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Abbreviations

nr	near-ring
IF	intuitionistic fuzzy
<i>N</i> -group	near-ring group
PNG	principal <i>N</i> -group
<i>DN</i> -group	distributive <i>N</i> -group

List of Symbols

\in	belongs to
\subseteq	subset
\cap	intersection
\cup	union
\Rightarrow	implies
\oplus	direct sum
\exists	there exists
\notin	not belongs to
\cong	isomorphic
\geq	greater than or equal to
\leq	less than or equal to
\leq_N	N -subgroup
\trianglelefteq_N	normal N -group
\trianglelefteq_{IFN}	intuitionistic fuzzy normal N -group
\triangleleft	left ideal
$Max(N)$	collection of all maximal ideals of N
\leq_{IFN}	intuitionistic fuzzy N -subgroup
\triangleleft_{IF}	intuitionistic fuzzy ideal
$Ann(E)$	annihilator of E