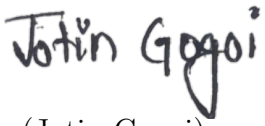
Dedicated to my beloved Parents.

Declaration by Candidate

I, **Jotin Gogoi**, hereby declare that the subject matter in this thesis entitled, **"Theory and Phenomenology of Neutrino Masses and Mixing in the Light of Latest Neutrino and Cosmology Data"**, is a presentation of my original research work. Although contributions of others are involved, every effort is made to indicate this clearly with due reference to the literature and acknowledgement of collaborative research and discussions.

This work is original and has not been submitted earlier as a whole or in part for a degree or diploma at this or any other institute or university.

This thesis is being submitted to Tezpur University for the degree of Doctor of Philosophy in Physics.



Place: Tezpur University

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Certificate by the Supervisor

This is to certify that the thesis entitled **"Theory and Phenomenology of Neutrino Masses and Mixing in the Light of Latest Neutrino and Cosmology Data"**, submitted to the School of Sciences, Tezpur University in partial fulfillment of the requirements for the award of the degree of **Doctor of Philosophy** in **Physics** is a record of original research work carried out by **Mr. Jotin Gogoi** under my supervision and guidance.

All help received by him from various sources has been duly acknowledged.

No part of the thesis has been submitted elsewhere for the award of any other degree.

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Certificate of the External Examiner and ODEC

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(Prof. Mrinal Kumar Das) (External Examiner)

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Date: 29/07/2025 Jotin Gogoi

Abbreviation

SM	Standard Model
PMNS	Pontecarvo-Maki-Nakagawa-Sakata
BSM	Beyond Standard Model
VEV	Vaccuum Expectation Value
LRSM	Left-Right Symmetric Model
LSND	Liquid Scintillator Neutrino Detector
NDBD/$0\nu\beta\beta$	Neutrinoless Double Beta Decay
DM	Dark Matter
C	Charge Conjugation
CP	Charge Conjugation and Parity
BAU	Baryon Asymmetry of the Universe
LFV	Lepton Flavor Violation
LNV	Lepton Number Violation
SAGE	Soviet American Gallium Experiment
GALLEX	Gallium Experiment
MARCO	Monopole Astrophysics and Cosmic Ray Observatory
MINOS	Main Injector Neutrino Oscillation Search
T2K	Tokai to Kamioka
RENO	Reactor Experiment for Neutrino Oscillation
SNO	Sudbury Neutrino Observatory
Daya-Bay	Daya Bay Reactor Neutrino Experiment
Double Chooz	Double Chooz Reactor Neutrino Oscillation Experiment
KATRIN	Karlsruhe Tritium Neutrino Experiment
CMB	Cosmic Microwave Background
MACHOs	Massive Compact Halo Objects
KamLAND-Zen	Kamioka Liquid Scintillator Antineutrino Detector-Xenon

GERDA	Germanium Detector Array
CUROE	Cryogenic Underground Observatory for Rare Events
SINDRUM	Swiss Institute for Nuclear Research Drum
Mu3e	Muon to Three Electrons Experiment
DeeMe	Direct Electron Emission from Muon to Electron
Mu2e	Muon to Two Electrons Experiment
COMET	Coherent Muon to Electron Transition
cLFV	Charged lepton flavor violation
VEV	Vacuum Expectation Value
MSW	Mikheyev Smirnov Wolfenstein
GUT	Grand Unified Theory
SSB	Spontaneous Symmetry Breaking
LHC	Large Hadron Collider
QCD	Quantum Chromodynamics
ISS	Inverse Seesaw
BR	Branching Ratio

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