

Table of Contents

Content	Page no.
<i>Abstract</i>	i-iii
<i>Declaration</i>	iv
<i>Certificate</i>	v
<i>Dedication</i>	vi
<i>Acknowledgement</i>	vii-viii
<i>Table of Contents</i>	ix-xiii
<i>List of tables</i>	xiv-xvi
<i>List of figures</i>	xvii-xxvi
<i>List of abbreviations and Symbols</i>	xxvii-xxix
 CHAPTER 1: Introduction	 1-9
1.1 Earthquake	1
1.2 Earthquake precursor	2
1.3 Gutenberg-Richter power law	4
1.4 Literature survey	5
1.5 Motivation behind the work	6
1.6 Objectives of the thesis	7
1.7 Thesis outline	7
1.8 References	8
 CHAPTER 2: Frequency-magnitude distribution factor (b-value)	 10-26
2.1 Introduction	10
2.2 Data Analysis	11
2.2.1 Homogenizing an earthquake catalog	11
2.2.2 Completeness analysis of an earthquake catalog	13
2.2.3 Declustering an earthquake catalog	15
2.3 Methodology	17
2.3.1 Least Squares Method	17
2.3.2 Maximum Likelihood Estimation (MLE)	18

2.4	Application of b-value analysis	18
2.4.1	Earthquake Forecasting and Early Warning	19
2.4.2	Gumbel extreme value approach	19
2.4.3	Stress Analysis and Tectonic Studies	21
2.4.4	Volcanic Seismology	22
2.5	References	23
CHAPTER 3:	Seismic Hazard Assessment and Source Zone Delineation	27-53
	in Northeast India: A case study of the Kopili Fault	
	Region and its Vicinity	
3.1	Introduction	27
3.2	Tectonic setup	28
3.3	Compilation of Earthquake catalog for the study region	30
3.4	Analysis of Seismic Activity, Estimating Maximum Magnitude (M _{max}), and Zoning Seismic Sources in the Study Area	30
3.5	Seismicity analysis and Estimation of seismic parameters	34
3.5.1	Earthquake magnitude completeness test	35
3.5.2	Earthquake catalog temporal completeness test	37
3.5.3	Estimation of seismic hazard parameters	39
3.6	Result and Discussion	41
3.6.1	Gumbel Extreme Value Theory: Understanding Extreme Event Analysis	41
3.6.2	Estimation of most likely extreme seismic magnitudes	42
3.6.3	Return period	44
3.6.4	Estimation of probability of occurrence of different magnitude	45
3.7	References	51
CHAPTER 4:	Case studies on spatio-temporal analysis b-value before	54-123
	the occurrence of major events with respect to different	
	regions	
4.1	Introduction	54
4.2	The 28th April 2021 Assam earthquake (M _w 6.4)	54
4.2.1	Introduction	54

4.2.2	Tectonic setup	56
4.2.3	Data analysis	57
4.2.4	b-value estimation	61
4.2.5	Results and discussions	64
4.3	The 26th November 2022 Mizoram earthquake (M_W 6.1)	69
4.3.1	Introduction	69
4.3.2	Tectonic setup	70
4.3.3	Data analysis	71
4.3.4	b-value estimation	73
4.3.5	Results and discussions	74
4.4	The 6th February 2023 Gaziantep, Türkiye Earthquake (M_W 7.8)	84
4.4.1	Introduction	84
4.4.2	Seismotectonic setup	85
4.4.3	Earthquake catalog and its analysis	86
4.4.4	Methodology	91
4.4.5	Result and Discussion	91
4.5	The November 9, 2022 Nepal earthquake (M_W 6.3)	104
4.5.1	Introduction	104
4.5.2	Tectonic setup	104
4.5.3	Data analysis	105
4.5.4	b-value estimation	108
4.5.5	Result and Discussion	109
	4.5.5.1 Spatial analysis of b-value	109
	4.5.5.2 Temporal analysis of b-value	112
	4.5.5.3 Depth-wise analysis of b-value	114
4.6	References	117
CHAPTER 5: Application of the GEV Approach for Seismic Hazard Analysis in the Kopili Fault, Indo-Burma, and EAFZ Regions		124-166
5.1	Introduction	124
5.1.1	Probabilistic estimation of seismic hazard attributes for Kopili region of northeast India	125

5.1.2	Introduction	125
5.1.3	Tectonic setup	126
5.1.4	Data Analysis	127
5.1.5	Estimation of seismic hazard parameters	127
5.1.6	Results and discussion	130
	5.2.5.1. Estimation of Most probable largest earthquake magnitude	130
	5.2.5.2. Estimation of Return period	132
	5.2.5.3. Calculation of probability of occurrence of earthquakes with different magnitudes	134
5.3	Probabilistic estimation of seismic hazard attributes for Indo-Burma region of northeast India	136
5.3.1	Introduction	136
5.3.2	Tectonic setup	137
5.3.3	Data Analysis	137
5.3.4	Estimation of seismic hazard parameters	138
5.3.5	Results and discussion	139
	5.3.5.1. Estimation of Most probable largest earthquake Magnitude	139
	5.3.5.2. Estimation of Return period	141
	5.3.5.3. Calculation of probability of occurrence of earthquakes with different magnitudes	142
5.4	Probabilistic estimation of seismic hazard attributes for East Anatolian Fault Zone (EAFZ) of Türkiye	145
5.4.1	Introduction	145
5.4.2	Tectonic setup	147
5.4.3	Data Analysis	150
5.4.4	Estimation of seismic hazard parameters	154
5.4.5	Results and discussion	157
	5.4.5.1. Estimation of Most probable largest earthquake magnitude	157
	5.4.5.2. Estimation of Return period	158

5.4.5.3. Calculation of probability of occurrence of earthquakes with different magnitudes	159
5.5 References	164
CHAPTER 6: The plausible correlation between b-value and radon gas anomalies	167-173
6.1 Introduction	167
6.2 Data Analysis	167
6.3 Methodology	168
6.4 Temporal anomalies in b-value and radon gas concentration	168
6.5 References	171
CHAPTER 7: Conclusions and Future prospects	174-180
7.1 Conclusions	174
7.2 Future prospects and directions	179
7.3 References	180
List of Publications	181-182