

# Contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
<b>2</b>	<b>Estimation of population mean using auxiliary variable under Midzuno-Sen type sampling scheme</b>	<b>17</b>
2.1	Summary . . . . .	17
2.2	Sampling strategy I . . . . .	18
2.2.1	A comparative study . . . . .	22
2.3	Sampling strategy II . . . . .	23
2.3.1	Efficiency comparison . . . . .	25
2.4	Numerical study . . . . .	25
2.5	Conclusion . . . . .	28
<b>3</b>	<b>Estimation of population mean using Midzuno-Lahiri-Sen type sampling scheme under double sampling</b>	<b>29</b>
3.1	Summary . . . . .	29
3.2	Double sampling strategy I . . . . .	30
3.3	Double sampling strategy II . . . . .	33

3.4	Efficiency comparison . . . . .	35
3.5	Numerical study . . . . .	35
3.6	Conclusion . . . . .	37
<b>4</b>	<b>A family of sampling strategies for estimation of population variance</b>	<b>38</b>
4.1	Summary . . . . .	38
4.2	Sampling strategy III . . . . .	39
4.3	Sampling strategy IV . . . . .	41
4.4	Efficiency Comparison . . . . .	43
4.5	Numerical Study . . . . .	45
4.6	Conclusion . . . . .	47
<b>5</b>	<b>An unbiased family of sampling strategies for estimation of population variance under double sampling</b>	<b>48</b>
5.1	Summary . . . . .	48
5.2	Double sampling strategy III . . . . .	49
5.3	Double sampling strategy IV . . . . .	51
5.4	Efficiency Comparison . . . . .	54
5.5	Empirical Study . . . . .	55
5.6	Conclusion . . . . .	57
<b>6</b>	<b>Optimal two parameter logarithmic estimator utilizing auxiliary information for population variance</b>	<b>58</b>
6.1	Summary . . . . .	58

6.2	Optimal two parameter logarithmic estimators for population variance using auxiliary variable . . . . .	59
6.2.1	Efficiency comparison . . . . .	63
6.2.2	Empirical study . . . . .	64
6.2.3	Conclusion . . . . .	67
6.3	Optimal two parameter logarithmic estimators for population variance using auxiliary attribute . . . . .	68
6.3.1	Efficiency comparison . . . . .	72
6.3.2	Empirical study . . . . .	73
6.3.3	Conclusion . . . . .	76
<b>7</b>	<b>On some improved class of double sampling log-type estimators for estimating the population variance</b>	<b>77</b>
7.1	Summary . . . . .	77
7.2	The suggested class of log-type estimators using auxiliary variable under double sampling . . . . .	78
7.2.1	Improved class of estimators using auxiliary variable under double sampling . . . . .	81
7.2.2	Efficiency comparison . . . . .	84
7.2.3	Empirical study . . . . .	85
7.2.4	Conclusion . . . . .	87
7.3	The suggested class of log-type estimators using auxiliary attribute under double sampling . . . . .	88

7.3.1	Improved class of log-type estimators using auxiliary attribute under double sampling . . . . .	91
7.3.2	Efficiency comparison . . . . .	94
7.3.3	Empirical study . . . . .	95
7.3.4	Conclusion . . . . .	97
<b>8</b>	<b>Log-type estimator using two auxiliary variable and two auxiliary attribute for estimating population variance</b>	<b>98</b>
8.1	Summary . . . . .	98
8.2	The suggested class of log-type estimators using two auxiliary variable . . . . .	99
8.2.1	Suggested estimators using multiple ancillary information . . . . .	101
8.2.2	Efficiency comparison . . . . .	102
8.2.3	Empirical study . . . . .	103
8.2.4	Conclusion . . . . .	104
8.3	Log-type estimator using auxiliary variable and attribute for estimating population variance . . . . .	105
8.3.1	Improved class of estimator using two auxiliary information . . . . .	106
8.3.2	Efficiency comparison . . . . .	108
8.3.3	Empirical study . . . . .	109
8.4	Conclusion . . . . .	111
<b>9</b>	<b>A new log type estimator for estimating the population variance under double sampling</b>	<b>112</b>
9.1	Summary . . . . .	112

9.2	The suggested generalized class of estimators . . . . .	113
9.2.1	Suggested classes of estimators using multiple prior information . . . .	115
9.2.2	Efficiency comparison . . . . .	116
9.2.3	Empirical study . . . . .	117
9.2.4	Conclusion . . . . .	118
9.3	Improved estimator using auxiliary variable and attribute . . . . .	119
9.3.1	A generalized estimator under double sampling for auxiliary variable and attribute . . . . .	120
9.3.2	Efficiency comparison . . . . .	121
9.3.3	Empirical study . . . . .	122
9.4	Conclusion . . . . .	124