MA323 – Monte Carlo Simulation

Lab - 07

Dipanshu Goyal 210123083

Question – 2

Lab 06 Answer – 1

M	**I_M** (estimated value of I)	**95% Confidence Interval**	**Width of Confidence Interval**
100	1.939856	(1.861093, 2.018619)	0.157526
1000	1.991991	(1.965119, 2.018862)	0.053743
10000	1.997912	(1.989242, 2.006582)	0.01734
100000	1.999248	(1.9965, 2.001995)	0.005495

Lab 07 Answer – 2

M	**I_M** (estimated value of I)	**95% Confidence Interval**	**Width of Confidence Interval**
100	2.007689	(2.000446, 2.014932)	0.014487
1000	2.000852	(1.998066, 2.003638)	0.005572
10000	1.999457	(1.998524, 2.00039)	0.001866
100000	1.999548	(1.999259, 1.999838)	0.000579

Observations:

M	**Width of Confidence Interval** (Simple)	**Width of Confidence Interval** (Antithetic)	**Ratio** (Simple/Antithetic)
100	0.157526	0.014487	10.87361082
1000	0.053743	0.005572	9.645190237
10000	0.01734	0.001866	9.292604502
100000	0.005495	0.000579	9.490500864

1. The variance after using Antithetic Estimator is much lesser than the simple method, and the width of confidence interval is also significantly reduced.

2. The I_M converges to the exact value 2 as M increases. The $\hat{I}_M$ calculated by antithetic method shows similar nature.

3. Both I_M and $\hat{I}_M$ values are almost the same, and their absolute difference is decreasing as M increases.