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1. Consider the expectation $I = E[\exp(\sqrt{U})]$ where, $U \sim U(0,1)$. Use the following antithetic method to approximate I:

$$\widehat{I}_M = \frac{1}{M}\sum_{i=1}^{M/2} \widehat{Y}_i \text{ where } \widehat{Y}_i = \exp(\sqrt{U_i}) + \exp(\sqrt{1-U_i}) \text{ with } U_i \sim U(0,1).$$

   Take the values of M to be $10^2, 10^3, 10^4$ and 10^5. Determine the 95% confidence interval for I_M for all the four values of M that you have taken.

2. Present the results that you have obtained in Question 1 of Lab 06 and Question 1 of Lab 07 in a tabular form. Your table must consist of the values of $\widehat{I}_M$ (using two methods), 95% confidence intervals for I (from two methods), and the ratio of widths of both the intervals. How do the values of I_M and $\widehat{I}_M$ compare with the actual value of I?

Submission Deadline: October 11, 2023, 11:50 PM