

Applied Stochastic Models (SS 09)

Problem Set 10

Problem 1

Describe how the integrals

$$\begin{aligned} (a) \quad & \int_0^1 e^{e^x} dx, \\ (b) \quad & \int_0^\infty \frac{x}{1+x^2} dx, \\ (c) \quad & \int_0^\infty \int_0^x e^{-(x+y)} dy dx \end{aligned}$$

can be approximated by simulation.

Problem 2

Let U be uniform in $[0, 1]$. Use simulation to approximate $Cor(U, \sqrt{1-U^2})$ and $Cor(U^2, \sqrt{1-U^2})$.

Problem 3

Use the inverse transform method to generate a random variable having the density function

$$\begin{aligned} (a) \quad f(x) &= e^x / (e - 1), \quad 0 \leq x \leq 1, \\ (b) \quad f(x) &= \frac{2}{\pi \sqrt{1-x^2}}, \quad 0 \leq x \leq 1. \end{aligned}$$

Use the inverse transform method to generate a random variable having the cdf

$$(c) \quad F(x) = \frac{1}{1 + e^{-x}}, \quad -\infty < x < \infty.$$

Problem 4

Use the acceptance-rejection method to generate a random variable with pdf

$$f(x) = 20x(1-x)^3, \quad 0 < x < 1.$$