ASSIGNMENT – 5

(1) f(x) = $\begin{cases} a + 2(1-a)x, & 0 \leq x \leq 1 \\ 0, & elsewhere \end{cases}$

Generate 5000 sample from the above distribution using <u>Probability Integral Transform</u> method, if possible (taking specific value of the parameter). If not, use the following method:

Generate $U_1, U_2, U_3 \sim U(0,1)$

If $U_1 \leq a$, $\{X = U_2\}$

Else, $\{X = \max(U_2, U_3)\}$

(2) Below you are given two algorithms each of which can be used to generate standard normal random variables (Try both separately).

Method I:

Generate $U_1, U_2 \sim U(0,1)$. Define

$X_1 = (-2 \ln U_1)^{½} \cos(2\pi U_2)$, $X_2 = (-2 \ln U_1)^{½} \sin(2\pi U_2)$

Then $(X_1, X_2) \sim N(0,1)$

Method II:

STEP I: Generate $U_1, U_2 \sim U(0,1)$, let $V_i = 2U_i - 1$, i=1,2; $W = V_1^2 + V_2^2$. If $W > 1$, freshly start step I.

STEP II: Let $Y = (-(2 \ln W)/W)^{1/2}$ and $X_1 = V_1 Y$, $X_2 = V_2 Y$. Then $(X_1, X_2) \sim N(0,1)$.

Note: In order to generate random variable from $N(\mu,\sigma^2)$ distribution, you should transform N(0,1) generated random variable X to variable $\sigma X + \mu$. For this specific problem you can take $\mu = 1$, $\sigma = 2$.