

**Hindi Vidya Prachar Samiti's
Ramniranjan Jhunhunwala College of Arts, Science and
Commerce(Autonomous)**

Programme: MSc. (Statistics)

Part-1

Semester-1

Practical- 1.1.2

**Generating & Visualizing Standard Continuous
Probability Distributions**

Date:

Q.1. Generate 1000 random observations, uniformly distributed between -1 and 1 plot the results as a histogram. Further repeat the same using an increased sample size of 10000.

Q.2. Consider x follows exponential distribution with parameter $\lambda = 0.5$.

- (i) Draw a graph of the probability distribution of x .
- (ii) Draw a graph of cdf of x .

Q.3. Plot graph of pdf of gamma distribution for the following values of parameters (a=shape, b=scale)

a=1, b=2

a=2, b=2

a=3, b=2

a=5, b=1

a=9, b=0.5

Q.4. Draw 1000 random samples from $X \sim \text{Exp}(\lambda=6)$ using R function `rexp` and transform the variable by its own cdf $F_X(x)=1-e^{-\lambda x}$, s.t. $Y=F_X(x)$. Comment on the distribution of Y .

Q.5. Draw 1000 samples from a $Y \sim \text{exp}(\lambda = 1)$ distribution, using the samples drawn from $X \sim U(0,1)$ with the R function `runif()` using probability integral transformation.

(Hint:

- First draw 1000 samples from $X \sim U(0,1)$
- Transform $Y = F_X^{-1}(x)$ with the inverse CDF $F_X^{-1}(x) = -(1/\lambda) \ln(1 - x)$
- Now Y has the same distribution as $F_Y^{-1}(y) = 1 - e^{-\lambda y}$

Q.6. $U \sim U(0,1)$ distribution. Show that both $-\log U$ and $-\log(1-U)$ are exponential random variables. (use `set.seed(1001)`)

Q.7. A statistics class takes two exams X (Exam 1) and Y (Exam 2) where the scores follow a bivariate normal distribution with parameters:

$\mu_x = 70$ and $\mu_y = 60$ are the marginal means and $\sigma_x = 10$ and $\sigma_y = 15$ are the marginal standard deviations, $\rho = 0.6$ is the correlation coefficient.

Suppose we select a student at random. What is the probability that –

- (a) the student scores over 75 on Exam 2?
- (b) the student scores over 75 on Exam 2, given that the student scored $X = 80$ on Exam 1?
- (c) the sum of his/her Exam 1 and Exam 2 scores is over 150?
- (d) $P(5X - 4Y > 150)$?

Q.8. Generate 200 random samples from Bivariate Normal distribution having $\mu_1=1$, $\mu_2=1$, $\sigma_1=2$, $\sigma_2=8$ and having population correlation between the variables as 0.6 .(Set seed:123. Use `mvrnorm()` function.)

Q.9. Generate 100 observations from log normal distribution with $\mu = 9$ and $\sigma = 2$. Hence plot the graph of p.d.f and c.d.f.

