

- (b) Generate 2 Poisson random variates with mean 2 using any suitable method. Use the following uniform random numbers: 0.3678, 0.7254, 0.1423, 0.8647, 0.5912. Show all steps clearly. (8,7)
7. (a) Given the following sequence of random numbers: 0.32, 0.57, 0.81:

Generate random variables with the following discrete probability distribution:

$x$	1	2	3
$P(X = x)$	0.4	0.3	0.3

Show all steps clearly using the inverse transform method.

- (b) Use simulation to estimate the value of the integral:

$$\int_0^1 x \, dx$$

Use the following random numbers: 0.15, 0.63, 0.42, 0.91 Show

- (i) The formula used for estimation  
 (ii) The final estimate  
 (iii) Compare with the true value (8,7)

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1258

I

Unique Paper Code : 2373010006 (NEP-UGCF)

Name of the Paper : Simulation Techniques in Statistics (DSE)

Name of the Course : BSc. (Hons.)

Semester : V

Duration : 3 Hours

Maximum Marks : 90

### Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **TWO** sections in this paper.
3. **All** sections are compulsory.
4. Use of nonprogrammable scientific calculator is allowed.

### **Section I**

(Attempt Any **FIVE** parts)

1. (a) Explain the concept of pseudo-random numbers and their importance in simulation.

P.T.O.

- (b) What is the difference between discrete and continuous simulation models?
- (c) Define Monte Carlo simulation and list two applications.
- (d) Explain the concept of inverse transform method with an example.
- (e) What is the purpose of statistical analysis of simulated data?
- (f) Define acceptance-rejection method and state its advantages. (5×3=15)

### Section II

*(Attempt Any FIVE questions)*

- 2. (a) Explain Linear Congruential Generator (LCG) method for generating pseudo-random numbers. What are the criteria for choosing good parameters?
- (b) Write the steps to generate random numbers using LCG with  $m = 8$ ,  $a = 5$ ,  $c = 1$  and initial seed  $x_0 = 3$ , in the usual notations. Generate first 5 numbers. (8,7)

- 3. (a) Explain how inverse transform method can be used to generate exponential random variables.
- (b) Using inverse transform method, generate 5 exponential random variates with mean 2 using the following random numbers :  
0.45, 0.82, 0.21, 0.63, 0.97 (8,7)
- 4. (a) Explain the acceptance-rejection method for generating random variables. What are its key components?
- (b) Use acceptance-rejection method to generate normal random variables. Explain the steps. (8,7)
- 5. (a) What is variance reduction in simulation? Explain the antithetic variates method with an example.
- (b) In a simulation study, how do you determine when to stop generating new data values? Explain with suitable criteria. (8,7)
- 6. (a) Explain how to generate Poisson random variables. Write down the steps for the same.