



## Department of Computer Science and Engineering

University of Barishal

Course Title: Simulation and Modeling

Course Code: CSE-4107

4<sup>th</sup> year 1<sup>st</sup> Semester Final Examination

Admission Session: 2016-2017

Time: 3 Hours

Marks: 60

Answer any five Questions from the followings.

1. a) Define System. Write the components of a system with an example. [4]  
b) Explain the characteristics of a System. [4]  
c) Define the following terms with example: i) Open System ii) Closed System [4]
2. ✓ At a grocery store with one counter, customers arrive at random from 1 to 8 [12]  
minutes apart (each of inter-arrival time has the same probability of occurrence).  
The service times vary from 1 to 6 minutes with the probabilities as 0.10, 0.20,  
0.30, 0.25, 0.10 and 0.05 respectively. Analyze the system by simulating the  
arrival and service of 15 customers. [Justifying your situation and requirements,  
you can choose your required random values]
3. ✓ a) Write short notes on the followings: [8]  
i) Weibull Distribution ii) Gamma Distribution  
iii) Geometric Distribution iv) Bernoulli Distribution  
b) A Hurricane is to hit in the country, and expected to follow poisson distribution [4]  
with a mean of 0.8 per year. Find the possibility of occurring more than two  
hurricanes in a year. Also find the possibility of exactly one hurricane in a year.
4. ✓ a) Explain over aspects and characteristics of a Queueing System. [8]  
b) Customers at a restaurant arrive in groups (one to eight persons). The number of [4]  
persons (per group) for 300 customers and the relative frequencies appear are  
shown below. Draw empirical CDF.

Arrivals per party	1	2	3	4	5	6	7	8
Frequency	30	110	45	71	12	13	7	12

5. a) Explain different methods of random number generation. [9]  
b) What are the challenges in generating pseudo random numbers. [3]

6. a) When Linear Congruential Generator is used? [2]  
 b) How Linear Congruential Generator is implemented? Explain with an example. [4]  
 c) Explain two methods of uniformity test with appropriate examples. [6]

7. a) Suppose that  $x$  and  $y$  are jointly discrete random variables with [3]

$$P(x, y) = (x+y)/30 \text{ for } x=0, 1, 2 \text{ and } y=0, 1, 2, 3 \\ = 0 \text{ otherwise}$$

Are  $x$  and  $y$  independent?

- b) Suppose that  $x$  and  $y$  are jointly continuous random variables with [6]

$$f(x, y) = y-x \text{ for } 0 < x < 1 \text{ and } 1 < y < 2 \\ = 0, \text{ otherwise}$$

Compute  $E(x)$ ,  $\text{Var}(x)$ ,  $E(y)$ ,  $\text{Var}(y)$ ,  $\text{Cov}(x, y)$ ,  $\text{Cor}(x, y)$

- c) Test for whether the 3rd, 8th, 13th, and so on, numbers in the following sequence [3]  
 at the beginning of this section are autocorrelated using  $\alpha = 0.05$ .

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.83	0.93
0.99	0.15	0.33	0.35	0.91	0.41	0.60	0.27	0.75	0.88
0.68	0.49	0.05	0.43	0.95	0.58	0.19	0.36	0.69	0.87

8. a) Explain how simulation and modelling can play an important role in [3]  
 Manufacturing and Material Handling System.
- b) Briefly describe probable simulation processes in a Manufacturing System [Use [6]  
 an appropriate example].
- c) Define verification in simulation process? Describe techniques to perform [3]  
 verification on simulation model.