

25/6/16

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Question Paper Code : 27316

5 Year M.Sc. DEGREE EXAMINATION, MAY/JUNE 2016

Seventh Semester

Software Engineering

ESE 072 – Modelling and Simulation

(Regulations 2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the applications of simulation ?
2. Differentiate validation and verification in a simulation study.
3. Define Poisson distribution.
4. What are the characteristics of queueing systems ?
5. List the applications of pseudo-random numbers.
6. What is the purpose of Weibull distribution ?
7. Define Arena.
8. What is a simulation package ?
9. List the suggested estimators for distributions used in simulation ?
10. Draw the pdf of normal distribution with $\mu = 6, \sigma = 3$.

PART – B (5 × 16 = 80)

11. (a) (i) Differentiate discrete and continuous simulation system with example. **(8)**

(ii) A baker is trying to figure out how many dozens of bagels to bake each day. The probability distribution of the number of bagel customers is as follows : **(8)**

Number of customers per day	8	10	12	14
Probability	0.35	0.30	0.25	0.10

Customers order 1, 2, 3, or 4 dozen bagels according to the following probability distribution

Number of dozens ordered/customer	1	2	3	4
Probability	0.4	0.3	0.2	0.1

Bagels sell for \$8.40 per dozen. They cost \$5.80 per dozen to make. All bagels not sold at the end of the day are sold at half-price to a local grocery store. Based on 5 days of simulation, how many dozen (to the nearest 5 dozen) bagels should be baked each day ?

OR

(b) (i) Explain single-channel queuing simulation with example. **(8)**

(ii) Students arrive at the university library counter with interarrival times distributed as

Time between arrivals (Minutes)	5	6	7	8
Probability	0.1	0.4	0.3	0.2

The time for a transaction at the counter is distributed as

Transaction time (Minutes)	2	3	4	5
Probability	0.15	0.5	0.2	0.15

If more than two students are in the queue, an arriving student goes away without joining the queue. Simulate the system and determine the balking rate of the students. **(8)**

12. (a) (i) There are two workers who are responsible for 10 milling machines. The machines run on the average for 20 minutes, then require an average 5-minute service period, both times exponentially distributed. Compute the various measures of performance for this system ? (6)
- (ii) Explain the four useful statistical models in detail. (10)

OR

- (b) (i) A recent survey indicated that 82% of single women aged 25 years old will be married in their lifetime. Using the binomial distribution, find the probability that two or three women in a sample of twenty will never be married. (6)
- (ii) Machines arrive for repair at the rate of six per hour following Poisson. The mechanics mean repair time is 15 minutes, which follows exponential distribution. The down time cost for the broken down machines per hour is ₹ 300. Mechanics are paid ₹ 60 per hour. Determine the optimal number of mechanics to be employed to minimize the total cost. (10)
13. (a) (i) What are the properties of random numbers. How will you check whether these properties have been achieved ? Explain. (10)
- (ii) Develop the triangular random-variate generator with range (0, 12) and mode 5. (6)

OR

- (b) (i) Describe Kolmogorov-Smirnov test. (8)
- (ii) Write a computer program to generate exponential random variates for a given mean value. Generate 1000 values and verify the variates generated using chi-square test. (8)
14. (a) (i) Simulate Single-Server Queue using C++. (8)
- (ii) Explain the guidelines for evaluation and selection of simulation software. (8)

OR

- (b) (i) Customers arrive at an Internet center at the rate of one every 15 ± 5 minutes. 80% of the customers check simply their email inbox, while the remaining 20% download and upload files. An email customer spends 5 ± 2 minutes in the centre and the download customer spends 15 ± 5 minutes. Simulate the service completion of 500 customers. Of these 500 customers, determine the number of email and download customers and compare with the input percentage ? (8)
- (ii) Write short notes on simulation in GPSS. (8)

15. (a) (i) Explain the estimators for distributors used in simulation. (8)
- (ii) What is the purpose of verification for simulation models ? Explain. (8)

OR

- (b) (i) With example, explain the validation process in detail. (8)
- (ii) Explain steady-state simulation with example. (8)