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Fifth Semester MCA Degree Examination, June/July 2018
System Simulation & Modeling

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1** a. Explain the steps of simulation study with a neat diagram. (10 Marks)
 b. Define system. Explain the components of a system for communication system. (10 Marks)
- 2** a. Discuss the concept of discrete random variables and continuous random variables. (06 Marks)
 b. A production process manufactures computer chips on the average of 2% non-conforming. Everyday a random sample of size 50 is taken from the process. If the sample contains more than 2 non-conforming chips, the process will be stopped. Determine the probability that the process is stopped by the sampling scheme. (07 Marks)
 c. A mainframe computer crashes in accordance with a Poisson process with a mean rate of one crash every 36 hours. Determine the probability that the next crash occur between 24 and 48 hours after the last crash. (07 Marks)
- 3** a. List the important considerations for generating Random numbers. (05 Marks)
 b. Use the linear congruential method to generate a sequence of random numbers with the following data:
 $X_0 = 27$, $a = 17$, $c = 43$, $m = 100$ (07 Marks)
 c. Apply Kolmogorov-Smirnov test for the following random numbers 0.44, 0.81, 0.14, 0.05, 0.93 to test the uniformity with significance α of 0.05. Write the conclusion. Given critical value is 0.565. (08 Marks)
- 4** a. Discuss the characteristics of Queuing system. (10 Marks)
 b. Depict the snapshot of (M, N) inventory system table with the given data:
 (i) $M = 11$ units, $N = 5$ days, Number of cycles = 3.
 (ii) Random digit assignment for daily demand:
 Demand : 0, 1, 2, 3, 4
 Probability : 0.10, 0.25, 0.35, 0.21, 0.09
 (iii) Random digits for lead time : 5, 0, 3, for cycle 1, cycle 2 and cycle 3 respectively. 8 units are expected to arrive in next 2 days.
 (iv) Random digits for demand
 Cycle 1 : 24, 35, 65, 81, 54
 Cycle 2 : 3, 87, 27, 73, 70
 Cycle 3 : 47, 45, 48, 17, 09
 (v) Beginning inventory level : 3
 Solve the following:
 • Find the average ending units in inventory.
 • Find the number of days shortage occurs. (10 Marks)
- 5** a. Explain event scheduling algorithm with a system snapshot. (10 Marks)
 b. Define the following:
 (i) System state (ii) Event (iii) Event notice
 (iv) Imminent event (v) process-interaction approach. (10 Marks)

- 6 a. Explain the steps in modeling the input data. (10 Marks)
- b. Records pertaining to the monthly number of jobs-related injuries at an underground coalmine were being studied by federal agency. The values for the past 100 months were as follows:

Injuries per month	Frequency of occurrence
0	35
1	40
2	13
3	6
4	4
5	1
6	1

Apply the chi-square test these data the hypothesis that the underlying distribution is Poisson for the significance value is 0.05; the critical value is 5.99 (10 Marks)

- 7 a. Explain iterative process of calibrating a model with neat diagram. (08 Marks)
- b. Explain Naylor and Finger approach for validating a model. (12 Marks)
- 8 a. Write short notes on point estimation and interval estimation. (10 Marks)
- b. List and discuss the method of reducing point estimator bias in a steady state simulation. (10 Marks)

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