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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  $\alpha$  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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