Eighth Semester B.E. Degree Examination, June/July 2023
System Modeling and Simulation

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1   a. Differentiate between Continuous and Discrete system.   **(05 Marks)**
    b. List three situations when simulation is appropriate tool and is not appropriate tool.
                                                                                (05 Marks)
    c. Explain the steps in a simulation study, with the flow chart.   **(10 Marks)**

2   a. A grocery store has one checkout counter. Customer arrive at this checkout counter at random from 1 to 8 minutes apart and each interval time has the same probability of occurrences. The service time vary from 1 to 6 minute with the probabilities as given below

S.T	1	2	3	4	5	6
P	0.10	0.20	0.30	0.25	0.10	0.05

Simulate the arrival of 10 customers and calculate :
i)   Average waiting time for a customer   ii)   Probability that a customer has to wait
iii) Probability of a server being idle   iv)   Average service time
v)   Average time between arrivals.
The random digits for IAT & ST are : 112 , 64 , 743 , 302 , 753 , 583 , 235 , 423 , 015 and 84 , 18 , 87 , 81 , 06 , 91 , 79 , 09 , 64 , 38 respectively.   **(14 Marks)**
    b. Explain the terms used in discrete event simulation with an example :
i)   Event   ii)   Event Notice   iii)   Future Event List (FEL)   iv)   Delay
v)   Clock   vi)   System State.   **(06 Marks)**

3   a. Explain Discrete Random Variables and Continuous Random Variables with example.
                                                                                (10 Marks)
    b. Explain Binomial and Poisson discrete distribution.   **(06 Marks)**
    c. Forty percent of the assembled ink – jet printers are rejected at the inspection station. Find the probability that the first acceptable ink – jet printer is the third one inspected.   **(04 Marks)**

4   a. Explain the characteristics of a queuing system. List different queuing notations.   **(10 Marks)**
    b. Explain the various steady state parameters of M/G/1 queue.   **(10 Marks)**

PART – B

5   a. Use Linear Congruential method to generate a sequence of 5 random numbers with :
$X_0 = 27$, $C = 43$, $a = 17$ and $m = 100$.   **(04 Marks)**
    b. The sequence of numbers 0.44 , 0.81 , 0.14 , 0.05 , 0.93 has been generated. Use the Kolmogorov – Sminrov test with $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. Compare F(x) and $S_N(x)$.
Note : $D_{0.05 , 5} = 0.565$.   **(10 Marks)**
    c. Suggest a step by step procedure to generate random variates using inverse transition technique for exponential distribution.   **(06 Marks)**

6   a. Enlist the step involved in development of a useful model of input data.   **(04 Marks)**

     b. Test whether the following data follows Poisson distribution using the Chi – Square test of goodness of fit. Use a level of significance of $\alpha = 0.05$.

        Note : $\chi^2_{0.05,\,2} = 5.99$.   **(10 Marks)**

Injuries/month	0	1	2	3	4	5	6
Frequency of Occurrences	35	40	13	6	4	1	1

     c. Mention the important points to be noted while collecting data.   **(06 Marks)**

7   a. Briefly explain the measure of performance of a simulation system.   **(10 Marks)**

     b. Explain the distinction between Terminating and Steady state simulation. Give examples.   **(10 Marks)**

8   a. With a neat diagram, explain the Iterative process of calibrating a model.   **(10 Marks)**

     b. Explain with neat diagram, Model building , Verification and Validation.   **(10 Marks)**

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