USN ☐☐☐☐☐☐☐☐☐☐   **10CS82**

Eighth Semester B.E. Degree Examination, June/July 2018
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. List any two advantages and disadvantages of simulation. **(04 Marks)**
  b. Explain with flow chart, the steps in simulation study. **(10 Marks)**
  c. A grocery store has one checkout counter customer arrive at this checkout counter at random from 1 to 8 minutes apart. And each interarrival time has the same probability of occurrence. The service time vary from 1 to 6 minutes, with the probability given below :

Service (minutes)	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Simulate the arrival of 6 customers and calculate the following :
  i) Average waiting time for the customer
  ii) Probability of a server being idle
  iii) Average service time
  Use the following sequence of random numbers :

Random digit for arrival time	913	727	15	948	309	
Random digit for service tune	84	10	74	53	17	79

(06 Marks)

2 a. Explain the term used in discrete event simulation with an example.
  i) System state   ii) list   iii) event   iv) FEL   v) delay   vi) clock. **(06 Marks)**
  b. Six dump trucks are used to haul coal from the entrance of small mine to railroad. Each truck is loaded by one of two loaders. After loading truck moves to scale, to be weighed. After weighing a truck beings a travel time and then returns to loader queue. it has been assumed that five of trucks are at loader and one at scale at time 0. By using event scheduling algorithm, find out busy time of loader and scale and stopping time E is 64 minutes.

Loading time	10	5	5	10	15	10	10
Weighing time	12	12	12	16	12	16	–
Travel time	60	100	40	40	80	–	–

(14 Marks)

3 a. Explain any two discrete distributions and give equation for probability mass function. Also calculate mean and variance. **(08 Marks)**
  b. A bus arrives every 20 minutes at a specified stop beginning at 6.40 AM and continuing until 8.40AM. A certain passenger does not know the schedule, but arrives randomly (Uniformly distributed) between 7.00 AM and 7.30 AM every morning. What is the probability that the passenger waits more than 5 minutes for a bus? **(06 Marks)**
  c. What is Poisson process? List out the assumptions which are needed to fulfill the counting process, $\{N(t), t \geq 0\}$ is said to be Poisson process with mean rate λ. **(06 Marks)**

4 a. Explain the characteristics of a queuing system. List different queuing notations. **(12 Marks)**
   b. Explain the various steady state parameters of the M/G/1 queue. **(08 Marks)**

PART – B

5 a. Generate 4 digit random numbers using multiplicative congruential method with $x_0 = 11$, $a = 43$, $m = 1000$. **(06 Marks)**
   b. The sequence of numbers 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated. Use Kolmogorov – Smirnov test with $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. [$D_\alpha = 0.565$]. **(08 Marks)**
   c. Suggest a step by step procedure to generate random variates using inverse transform technique for exponential distribution. **(06 Marks)**

6 a. Explain four methods of selecting input models without data. **(06 Marks)**
   b. The number of vehicles arriving at a junction in a five minute period is observed for 10 days. The resulting data is as follows :

Number of arrivals	0	1	2	3	4	5	6	7	8	9	10	11
Frequency	12	10	19	17	10	8	7	5	5	3	3	1

It is presumed that the arrivals follows a Poisson distribution with parameters $\alpha = 3.6$. Using Chi-Square test, determine whether the assumptions that arrivals follow Poisson distribution can be accepted at a 0.05 level of significance. **(08 Marks)**
   c. Explain types of time-series input models. **(06 Marks)**

7 a. Explain types of simulations with respect to output analysis with suitable examples. **(10 Marks)**
   b. Explain any two output analysis for steady state simulations. **(10 Marks)**

8 a. Explain with a neat diagram model building, verification and validation. **(10 Marks)**
   b. Describe with a neat diagram iterative process of calibarasing a model. Which are three steps that aid in the validation process? **(10 Marks)**

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