## Model Question Paper for Minor Exam I

**MINOR EXAM -1**

**SEM: VII Sub: System Simulation and Modeling**

**Max. Marks: 40 Duration: 75 minutes.**

|  |  |  |
| --- | --- | --- |
| 1a | Define the following: (i) System (ii) Entity (iii) Attributes (iv) Activities (v) Events (vi) State variables. Identify these components for Banking.  | (6 marks) |
| 1b | A small shop has one check out counter. Customers arrive at this counter at random from 1 to 10 minutes apart. Each possible value of inter arrival time has the same probability of occurrence equal to 0.10. The service times vary from 1 to 6 minute with probability shown below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Service time  | 1 | 2 | 3 | 4 | 5 | 6 |
| Probability | .05 | .10 | .20 | .30 | 0.25 | 0.10 |

Develop simulation table for 10 customers. Find i) average waiting time ii) average service time i) average time customer spends in the system. Random digits for arrivals as -91, 72, 15, 94, 30, 92. 75, 23. 30 and for service times are: 84, 10, 74, 53, 17, 79, 91, 67, 89, 38 sequentially.  | (8 marks) |
| 1c | Use the mixed congruential method to generate the sequence of three two digit random integers between 0 and 24 with X0=13, a=9, and c=35. | (6marks) |
| 2a | Explain with a flow chart the steps involved in a simulation study. | (8 marks)  |
| 2b | Explain in brief working of Queuing systems with the help of neat diagrams. | (6 marks) |
| 2c | With the help of exponential distribution, explain the steps involved in the inverse transform technique of generating random variates. | (6 marks) |
| 3a | List any four advantages and disadvantages of simulation. | (4 marks) |
| 3b | Consider the following continuous operating job shop. Interarrival times of the job are distributed as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time between arrivals | 0 | 1 | 2 | 3 |
| Probability | 0.23 | 0.37 | 0.28 | 0.12 |

Processing times for jobs are normally distributed, with mean 50 minutes and standard deviation 8 minutes. Construct a simulation table and perform a simulation for 10 new customers. Assume that when simulation begins there is one job for being processed and there is one job with a 50 min processing time in the queue.a) What was the average time in the queue for the new jobs?b) What was the average processing time for 10 new jobs?c) What was the maximum time in the system for the 10 new jobs? | (8 marks) |
| 3c | For the following set of data apply Chi-square test to test whether they are uniformly distributed or no. Take α=0.05 and 20 intervals…

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.34 | 0.90 | 0.25 | 0.89 | 0.87 | 0.44 | 0.12 | 0.21 | 0.46 | 0.67 |
| 0.83 | 0.76 | 0.79 | 0.64 | 0.70 | 0.81 | 0.94 | 0.74 | 0.22 | 0.74 |
| 0.96 | 0.99 | 0.77 | 0.67 | 0.56 | 0.41 | 0.52 | 0.73 | 0.99 | 0.02 |
| 0.47 | 0.30 | 0.17 | 0.82 | 0.56 | 0.05 | 0.45 | 0.31 | 0.78 | 0.05 |
| 0.79 | 0.71 | 0.23 | 0.19 | 0.82 | .093 | 0.65 | 0.37 | 0.39 | 0.42 |
| 0.99 | 0.17 | 0.99 | 0.46 | 0.05 | 0.66 | 0.10 | 0.42 | 0.18 | 0.49 |
| 0.37 | 0.51 | 0.54 | 0.01 | 0.81 | 0.28 | 0.69 | 0.34 | 0.75 | 0.49 |
| 0.72 | 0.43 | 0.56 | 0.97 | 0.3 | 0.94 | 0.96 | 0.58 | 0.73 | 0.05 |
| 0.06 | 0.39 | 0.84 | 0.24 | 0.4 | 0.64 | 0.4 | 0.19 | 0.79 | 0.62 |
| 0.18 | 0.26 | 0.97 | 0.88 | 0.64 | 0.47 | 0.6 | 0.11 | 0.29 | 0.78 |

 | (8 Marks)  |

## Model Question Paper for Minor Exam II

**SEM: VII Sub: System Simulation and Modeling**

**Max. Marks: 40 Duration: 75 minutes.**

|  |  |  |
| --- | --- | --- |
| 1a) | Explain the execution of arrival event and departure event with respect to time advance algorithm using flowcharts  | (8 marks) |
| 1b) | Explain the steps in the development of useful model of input data.  | (6 marks) |
| 1 c) | Describe in brief the output analysis of steady state simulations. | (6 marks) |
| 2a) | One company uses 6 trucks to haul manganese ore from Hospet to its industry. There are two loaders, to load each truck. After loading, a truck moves to the weighing scale to be weighed. The queue discipline is FIFO. When it is weighed a truck travels to the industry and returns to the loader queue. The distributions of loading time, weighing time and travel time are as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Loading times  | 10 | 5 | 5 | 10 | 15 | 10 | 10 |
| Weigh times | 12 | 12 | 12 | 16 | 12 | 16 |  |
| Travel times | 60 | 100 | 40 | 40 | 80 |  |  |

Calculate the total busy time of both loaders, of the scale average loader and scale utilization. Assume 5 trucks are at the loaders and one is at the scale at time '0' Stopping time TE=64min.  | (8 marks) |
| 2b) | The following data are randomly generated from a gamma distribution. Determine the maximum likelihood estimators $\hat{β }$and $\hat{θ }$

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1.691 | 1.437 | 8.221 | 5.976 | 1.116 | 4.435 | 2.345 | 1.782 | 3.81 | 4.589 |
| 5.313 | 10.9 | 2.649 | 2.432 | 1.581 | 2.432 | 1.843 | 2.466 | 2.833 | 2.361 |

 | (6 marks) |
| 2c) | Explain the point estimation method used for measuring the performance of simulated system. | (6 marks) |
| 3a) | What is List Processing? What are its basic properties?  | (6 marks)  |
| 3b) | Describe how the method of histograms can be used to identify the shape of distribution. | (6 Marks) |
| 3c) | Define and differentiate with an example, terminating and Non terminating simulations | (8 marks) |

## Model Question Paper for Semester End Examination

**COURSE: System Simulation and Modeling SEM: VII**

**MAX. MARKS: 100 DURATION: 3HOURS**

***NOTE:*** Answer **five** questions;any **two full questions** from each **unit-I and unit-II** and **one full**

 **question** from **unit-III**

|  |  |  |
| --- | --- | --- |
|  | UNIT 1 |  |
| 1a | Define simulation. When simulation is an appropriate tool | (6 marks) |
| b | A small grocery store has only one checkout counter. Customers arrive at this checkout counter at random times that are from 1 to 10 min apart having equal probability of occurrence. The service times vary from 1 to 6 min with the probability shown in the table no. 2. Compute the percentage of idle and busy times of the server by manual simulation done for 15 customers. The service times and random digits are specified in the table below. Also compute the average time customer spends in the system. RD for IAT: 06,11,67,28,87,58,13,42,03,41,46,84,73,35. RD for ST: 84,18,87,81,06,91,79,09,64,38,94,32,79,92,46

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Service Time | 1 | 2 | 3 | 4 | 5 | 6 |
| Probability | 0.1 | 0.2 | 0.3 | 0.25 | 0.1 | 0.05 |

 | (8 marks) |
| c | What is event scheduling/time advance algorithm? Name the component that will perform the activities of this algorithm. | (6 marks) |
|  |  |  |
| 2a | Explain the steps in a simulation study | (6 marks) |
| b | Define the terms Lead time, average waiting time in a queue, and average service time | (6 marks) |
| c | Six trucks are used to haul coal from a mine to the rail road. There are two loaders and one weighing scale. After loading, a truck immediately moves to the scale for weighing & servicing is as per FCFS. After weighing a truck , begins a travel time and then afterwards return to the loader queue with the distribution of travel time as:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Travel time in mins | 40 | 60 | 80 | 100 |
| Probability | 0.4 | 0.3 | 0.2 | 0.1 |

Further the distribution of loading time and weighing time are as:

|  |  |  |  |
| --- | --- | --- | --- |
| Loading time (in mins) | 5 | 10 | 15 |
| Probability | 0.3 | 0.5 | 0.2 |

|  |  |  |
| --- | --- | --- |
| Weighing Time (in mins) | 12 | 6 |
| Probability | 0.7 | 0.3 |

The random digits for the loading time, weighing time, travelling timecan be taken from the table below:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6 | 4 | 8 | 10 | 5 | 2 | 1 | 7 | 5 | 1 | 6 | 8 | 8 |
| 9 | 6 | 1 | 6 | 1 | 4 | 4 | 5 | 10 | 5 | 10 | 1 | 5 |
| 8 | 6 | 8 | 8 | 3 | 4 | 10 | 9 | 6 | 0 | 6 | 6 | 2 |
| 8 | 1 | 6 | 3 | 9 | 2 | 10 | 2 | 8 | 8 | 2 | 2 | 1 |
| 10 | 6 | 2 | 4 | 8 | 3 | 9 | 9 | 2 | 9 | 10 | 0 | 8 |
| 2 | 5 | 2 | 8 | 1 | 4 | 1 | 3 | 5 | 7 | 1 | 3 | 6 |
| 5 | 1 | 10 | 0 | 7 | 0 | 1 | 10 | 0 | 2 | 1 | 4 | 5 |

Simulate for 1 hr and estimate the busy time of the loaders and the scale. | (8 marks) |
|  |  |  |
| 3a | With examples differentiate between (i) continuous and discrete systems (ii) endogenous and exogenous activity. | (8 marks) |
| b | 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:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of customers per day | 8 | 10 | 12 | 14 |
| probability | 0.35 | 0.3 | 0.2 | 0.1 |

Customers order 1, 2, 3 or 4 dozen bagels according to the following distributions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of dozen ordered/customer | 1 | 2 | 3 | 4 |
| Probability | 0.4 | 0.3 | 0.2 | 0.1 |

Bagels are sold at Rs 8.40 per dozen and they cost Rs 5.80 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. | (6 marks) |
| c | Explain the execution of arrival event and departure event with respect to time advance algorithm using flowcharts | (6 marks) |
|  | UNIT 2 |  |
| 4a | Explain frequency test for generation random numbers. | (8 marks) |
| b | How to identify the distribution on data using Q-Q plots. | (6 marks) |
| c  | Derive the equation for point and interval estimation.  | (6 marks) |
|  |  |  |
| 5a | What is acceptance-Rejection technique? Generate 3 Poisson variates with mean***α=*0.2**. | (6 marks) |
| b | Explain Chi-square goodness of fit test. Apply it to Poisson assumption with ***α=*3.64 ,** data size=100 and observed frequency (Oi) :12 10 19 17 10 8 7 5 5 3 3 1  | (8 marks) |
| c | Define terminating simulation and derive the equation for fixed number of replications | (6 marks) |
|  |  |  |
| 6a | Generate random integers using multiplicative congruential method with  *X0*= 17, a = 43 and *m* =100. | (6 marks) |
| b | Explain in brief the multivariate and time variate input models. | (6 marks) |
| c | Explain the different cases in which Yrj can be derived using replication method for steady state simulation. | (8 marks) |
|  | UNIT 3 |  |
| 7a | Differentiate between calibration of system model & validation of system model. | (6 marks) |
| b | The demand and lead time for product 'X' are as follows :

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Demand | 83 | 103 | 96 | 92 | 109 | 106 | 104 | 112 | 97 | 116 |
| Lead time | 4.3 | 6.5 | 6.3 | 4.5 | 7.3 | 5.8 | 6.9 | 6.9 | 6.0 | 6.9 |

Test whether lead time and demand are dependent or not. Comment. | (12 marks) |
|  |  |  |
| 8a | Describe the different levels of abstraction in computer system with a neat diagram. | (8 marks) |
| b | Explain the various steps involved in ILP CPU | (6 marks) |
| c | Illustrate the LRU stack evolution with an example | (6 marks) |