K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SESSION: 2021-2022 (EVEN SEMESTER)
I SESSIONAL TEST QUESTION PAPER

SET-A

USN										

Degree : **B.E** **Semester** : **VI 'A'&'B'**
Branch : **Computer Science & Engineering** **Date** : **17-05-2022**
Course Title : **System Simulation and Modeling** **Course Code** : **18CS645**
Duration : **90 Minutes** **Max Marks** : **30**

Note: Answer ONE full question from each part

Q. No.	Question	Marks	K Level	CO
	PART-A			
1(a)	A small grocery store has only one checkout counter. Customers arrive at this counter at random from 1 to 5 minutes apart. Each possible value of inter arrival time has the same probability of occurrence equal to 0.20. The service times vary from 1 to 6 minutes apart with probabilities shown below: **Service time**: 1 | 2 | 3 | 4 | 5 | 6 **Probability**: 0.10 | 0.20 | 0.30 | 0.25 | 0.10 | 0.05 **Develop** simulation table for 5 customers. Random digits for arrivals: 91, 72, 15, 94. Random digits for service: 84, 10, 74, 53, 17.	5	Applying K3	CO1
(b)	**Calculate** the following for simulated table generated for question 1(a). i) The average time between arrivals ii) The probability that customer has to wait in queue iii) The average service time iv) Average waiting time of customer v) Probability of idle time of server	5	Applying K3	CO1
(c)	**Define** pseudo random numbers. **Explain** the problems or errors that occur while generating pseudo random numbers.	5	Understanding K2	CO2
	OR			
2(a)	Six dump trucks are used to load coal from the entrance of a mine to rail road . Each truck is loaded by one of the two loaders. After loading, a truck immediately moves to the scale, to be weighed as soon as possible. Both the loaders and the scale have first come first served waiting line for trucks. Travel time from a loader to scale is considered negligible. After being weighed, a truck begins travel time (during which time truck unloads) and then returns to loader queue. The activities of loading, weighing and travel time are given below:	5	Applying K3	CO1

	<table><tr><td>Loading time</td><td>10</td><td>5</td><td>5</td><td>10</td><td>15</td><td>10</td><td>10</td></tr><tr><td>Weigh time</td><td>12</td><td>12</td><td>12</td><td>16</td><td>12</td><td>16</td><td></td></tr><tr><td>Travel time</td><td>60</td><td>100</td><td>40</td><td>40</td><td>80</td><td></td><td></td></tr></table> End of simulation is completion of 2 weighing's from the scale. **Develop** the simulation table assume that five of the trucks are at loaders and one is at the scale at time 0.			
(b)	**Find out** average loader and scale utilization for the simulation table generated in question 2(a).	5	Applying K3	CO1
(c)	**Explain** combined linear congruential method for random number generation.	5	Understanding K2	CO2
	PART-B			
3(a)	With the help of a neat flow diagram **illustrate** the various steps in simulation study.	5	Understanding K2	CO1
(b)	**Interpret** the event scheduling/time advance algorithm.	5	Understanding K2	CO1
(c)	The sequence of random numbers 0.54, 0.73, 0.98, 0.11, and 0.68 has been generated .Use K-S test with alpha=0.05 to **determine** if the hypothesis that numbers are uniformly distributed on the interval[0,1] can be rejected. Take D α=0.565.	5	Applying K3	CO2
	OR			
4(a)	**List and explain** advantages and disadvantages of simulation.	5	Understanding K2	CO1
(b)	**Outline** the following terms i)Event ii)Activity iii)Future Event notice list iv)Delay v)System state		Understanding K2	CO1
(c)	**Find out** sequence .of 5 random members using linear congruential method for given values X0=63; C=1, a=19, M=100.	5	Applying K3	CO2

Course Incharge **HOD CSE** **IQAC- Coordinator** **Principal**

12/5/22

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<table>
<tr><th>Q. No.</th><th>Question</th><th>Marks</th><th>K Level</th><th>CO</th></tr>
<tr><td colspan="5">PART-A</td></tr>
<tr><td>1(a)</td><td>Construct a simulation table using event scheduling time advance algorithm for a checkout counter, stop the simulation when clock reaches 20.
<table>
<tr><td>Inter arrival times</td><td>3</td><td>2</td><td>6</td><td>2</td><td>4</td><td>5</td></tr>
<tr><td>Service times</td><td>2</td><td>5</td><td>5</td><td>8</td><td>4</td><td>5</td></tr>
</table></td><td>5</td><td>Applying K3</td><td>CO 1</td></tr>
<tr><td>(b)</td><td>Develop a manual simulation table for single server queuing system of a grocery shop for 5 customers. Customers arrive at shop randomly from 1 to 8 minutes apart and have equal probability. Service time varies from 1 to 6 min. The random digits for IAT and ST are 425, 913,727,015 and 84,10,74,53,17 respectively. The service distribution is given below:
<table>
<tr><td>Service time</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Probability</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.25</td><td>0.1</td><td>0.5</td></tr>
</table></td><td>5</td><td>Applying K3</td><td>CO 1</td></tr>
<tr><td>(c)</td><td>Define random number. Summarize the properties of random numbers.</td><td>5</td><td>Understanding K2</td><td>CO 2</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>2(a)</td><td>A company uses 6 trucks to haul manganese are from Kolar to 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 distribution of loading time, weighing time and travel time are as follows:
<table>
<tr><td>Loading times</td><td>10</td><td>5</td><td>10</td><td>10</td><td>5</td><td>10</td><td>5</td></tr>
</table></td><td>5</td><td>Applying K3</td><td>CO 1</td></tr>
</table>

	Weigh time	12	16	12	12	16	12	12		
	Travel times	40	60	40	80	100	40			

End of simulation when clock reaches t=20.

Develop the simulation table, assume that five of the trucks are at loaders and one is at the scale at time 0.

(b)

A computer technical support center is staffed by two people, Able and Baker who takes calls and tries to answer questions and solve computer problems. The time between calls ranges from 1 to 4 minutes, with distribution shown in table1. Baker is more experienced and can provide service faster than Able. The distributions of service times are in table2 below. When both are idle able takes call. If both are busy the call goes on hold. **Construct** the simulation table for the first 5 calls.

Table 1 Inter arrival distribution of calls for technical support

Inter arrival time in minutes	probability
1	0.25
2	0.40
3	0.20
4	0.15

Table 2 Distribution of Able's service time

Service time in minutes	Probability
2	0.30
3	0.28
4	0.25
5	0.17

Table 3 Distribution of Bakers's service time

Service time in minutes	Probability
3	0.35
4	0.25
5	0.20
6	0.20

RDA for arrival : 26,98,90,26

RDA for service :95,21,51,92,89

5 | **Applying K3** | **CO 1**

(c) **Explain** the role of maximum density, maximum period in random number generation and write three ways of achieving maximal period.

5 | **Understanding K2** | **CO 2**

	PART-B			
3(a)	**Define** simulation. **Explain** advantages and disadvantages of simulation.	**5**	**Understanding K2**	**CO 1**
(b)	With the help of a neat flow diagram **interpret** the various steps in simulation study.	**5**	**Understanding K2**	**CO 1**
(c)	**Find out** sequence of 5 random members using linear congruential method for given values X0=27, C=43, a=17, M=100.	**5**	**Applying K3**	**CO 2**
	OR			
4(a)	**Explain** the event scheduling algorithm by generating system snapshots at clock=t and clock=t1.	**5**	**Understanding K2**	**CO 1**
(b)	**Define** system and system environment. **Discuss** the components of a system with examples.	**5**	**Understanding K2**	**CO 1**
(c)	The sequence of random numbers 0.44,0.81,0.14,0.05,0.93 has been generated. Use K – S test with $\alpha = 0.05$ to **determine** if the hypothesis that the numbers are uniform distributed on the interval [0, 1] can be rejected. Take $D\alpha = 0.565$.	**5**	**Applying K3**	**CO 2**

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