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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fifth Semester, Master of Computer Applications (MCA)

Semester End Examination; Dec - 2016/Jan - 2017

System Simulation and Modeling

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. What is simulation? When simulation is appropriate and when it is not appropriate? 10

b. Define system environment, event, activity, exogenous and endogenous events give an example for each. 10

2 a. What are the steps involved in simulation study, write the flow diagram and briefly explain the importance of validation. 10

b. List the advantages and disadvantages of simulation. Mention few applications. 10

UNIT - II

3 a. Why random numbers are required? What are the important considerations in random numbers routines? Explain. 10

b. Using the multiplicative congruential method, find the period of the generator for a = 13, m = 64 and X_0 = 1, 2, 3, 4. 10

4 a. What are the steps involved to test uniformity of random numbers generated by Kolmogorov-Smirnov Test. 10

b. How random variate generation occurs? What are the steps involved in generating random variates by inverse transform technique. 10

UNIT - III

5 a. Explain the characteristics of queuing system. List the different queuing notations. 10

b. A small grocery store has only one checkout counter. Customers arrive at the checkout counter at random from 1 to 8 minutes apart. Each possible value of the inter arrival time has the same probability of occurrence. The serving times vary from 1 to 6 minutes with the probability. 10

Service Time	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Analyze the system with average waiting time, idle time of the server and average service time by simulating for 10 customers. Use following random numbers for arrival and service time. 913, 727, 015, 948, 309, 922, 753, 235, 302, and 84, 10, 74, 53, 17, 79, 91, 67, 89, 38.

Contd….2

6 a. Given the following data simulate the Able and Baker Problem for five customers,

Inter arrival Distribution of Cars	Time Between Arrivals	1	2	3	4
	Probability	0.25	0.40	0.20	0.15

Service distribution of Able		Service Distribution of Baker	
Service Time (Minutes)	Probability	Service Time (Minutes)	Probability
2	0.30	3	0.35
3	0.28	4	0.25
4	0.25	5	0.20
5	0.17	6	0.20

10

Random digits for arrival are 45, 24, 34, 89 and for service 01, 24, 43, 54, 35.

b. The inventory system containing maximum inventory level 11 units and review period is 5 days. The beginning inventory is 3 units. The order for 8 units available on the morning of the third day of the first cycle. Simulate for the 3 cycle of 5 days to estimate the average ending units in inventory and the number of days when a shortage condition occurs. The probabilities for the daily demand and lead times are as follows.

Daily Demand	
Demand	Probability
0	0.10
1	0.25
2	0.35
3	0.21
4	0.09

Lead Time	
Lead Time	Probability
1	0.6
2	0.3
3	0.1

10

The random digits for the demand are 24, 35, 65, 81, 54, 03, 87, 27, 73, 70, 47, 45, 48, 17, 09 and for lead time 05, 00, 03 respectively.

UNIT - IV

7 a. Explain Bootstrapping, list the steps involved in event scheduling algorithm. 10

b. List the steps involved in the development of a useful model of input data. 10

8 a. Explain Chi-square goodness of fit test. Apply it to Poisson assumption with $\alpha = 3.64$. Data size = 100 and observed frequency O_i = 12, 10, 19, 17, 10, 8, 7, 5, 5, 3, 3, 1. 10

b. Prepare a table using event scheduling/time advance algorithm for a checkout counter. Stop the simulation when the fifth customer departs. Estimate mean response time and Proportion of customers who spent 4 or more minutes in the system. Event notice must have event type, Time and customer number. 10

Inter Arrival Times	-	8	6	1	8	3
Service Times	4	1	4	3	2	4

UNIT - V

9 a. Explain with a neat diagram, model building, and verification and validation process. 10

b. Describe the three step approach to validation by Naylor and Finger. 10

10 a. Explain the types of simulation with respect to output analysis give at least two examples. 10

b. Explain output analysis for steady state simulation. 10

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