



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

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, Master of Computer Applications (MCA)

Semester End Examination; Dec. - 2019

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? What are its advantages and disadvantages? 8
- b. Explain the steps involved in a simulation study with the help of a flowchart. 12
- 2 a. Differentiate discrete versus continuous system simulation. 6
- b. What is a model? Name the different type of Models. 6
- c. What is system and system environment? With examples explain the components of a system. 8

UNIT - II

- 3 a. Random numbers generated by a technique satisfies the uniformity and independence. Justify. 4
- b. Test whether the 3rd, 8th, 13th and so on, numbers in the sequence are autocorrected using $\alpha = 0.05$

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.83	0.93
0.99	0.15	0.33	0.35	0.91	0.41	0.60	0.27	0.75	0.88
0.68	0.49	0.05	0.43	0.95	0.58	0.19	0.36	0.69	0.87

The critical value $Z_{\alpha/2} = 1.96$.

- c. Discuss briefly Acceptance-Rejection technique. 8
- 4 a. Give a step by step procedure to generate random variates using inverse transform technique for exponential distribution. 8
- b. Generate 3 Poisson variates with mean $x = 0.2$. Use the following random number 0.4357, 0.4146, 0.8353, 0.9952, 0.8004. 6
- c. Explain briefly Linear Congruential method generating random number. 6

UNIT - III

- 5 a There is only one telephone in a public booth of a railway station. The following table indicates the distribution of callers, arrival time and duration of the calls.

Time between arrival (units)	1	2	3	4	5	6	7	8
Probability	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125

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

Simulate for 20 customers of the current system using the following random digits for Inter Arrival Time (IAT) and Service Time (ST) and Compute Average waiting time, Average Idle time. Average service time and Expected service time. It is proposed to add another telephone to the booth. Justify the proposal based on the waiting of the caller. 14

Use the following Random digit to determine inter arrival time and service time

Inter

Inter arrival time : 913, 727, 015, 948, 309, 922, 753, 235, 302, 109, 093, 607, 738, 359, 888, 106, 212, 493, 535.

Service time: 84, 10, 74, 53, 17, 79, 91, 67, 89, 38, 32, 94, 79, 05, 79, 84, 52, 55, 30, 50.

b. Discuss the characteristics of queuing System. 6

6 a. Simulate an (M, N) inventory system over 5 cycles for the following specification M = 11 units, N =5 days. To start with there are 3 units in the inventory with 8 units ordered with a lead time of one day. Assume the lead time to be one, three, one, one, two days for the 5 cycles respectively. The demand probability and random digit to be used are given below:

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

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Find the average ending inventory and number of shortage days.

Cycle	Random digits
1	24, 35, 65, 81, 54
2	03, 87, 27, 73, 70
3	47, 45, 48, 17, 09
4	42, 87, 26, 36, 40
5	07, 63, 19, 88, 94

b. Discuss Queuing notation in brief. 4

UNIT - IV

7 a Using the event scheduling and time advance algorithm, draw the flowcharts for the execution of arrival event, execution of departure event for a single channel queue. 10

b. Describe the four steps in input model development. 10

8 a. How histogram is useful in identifying the shape of a distribution? Explain with an example. 8

b. Briefly discuss the concepts in discrete event simulation. 6

c. Apply K-S test for the 5 generated numbers are 0.44, 0.81, 0.14, 0.05, 0.93. With the $\alpha = 0.05$. 6

UNIT - V

9 a. Clearly distinguish between verification and validation. 4

b. What are the processes involved in the validation of system modeling ? Explain. 10

c. Discuss in brief the output analysis for terminating simulations. 6

10 a. Explain three step approaches for validation of system modeling. 10

b. Explain the types of simulation with respect to output analysis. Give two examples. 10