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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 - 2017/Jan - 2018
System Simulations 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?	6
b.	Briefly explain the types of models used in simulation studies.	6
c.	Explain the steps involved in a simulation study with the help of a flow chart.	8
2 a.	Justify when is the simulation is appropriate tool for solving real time applications.	6
b.	Differentiate between continuous and discrete systems.	6
c.	What is system and system environment? With examples explain the components of a system.	8

UNIT - II

3 a. 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	0.55	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

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The critical value $Z_{0.0}25 = 1.96$.

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

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4 a. The sequence of numbers 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated use the Kolmogorov Smirnov test with $a = 0.05$ to know whether the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. $D_\alpha = 0.565$.

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b. Explain the properties of Random numbers.

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UNIT - III

5. There is only one telephone in 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

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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 time of the caller.

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

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

6 a. Simulate an (M, N) inventory 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 digits to be used are given below:

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

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

16

b. Discuss the characteristics of Queuing system.   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. Explain the chi-square test for Poisson and exponential distribution candidate distribution.   10

8 a. How histogram is useful in identifying the shape of a distribution? Explain with an example.   10

b. Explain an Event- Scheduling/ Time- Advanced Algorithm.   10

UNIT - V

9 a. Differentiate between validation and verification in system modelling.   4

b. Discuss how the performance of a simulated system is measured and estimated, with suitable illustrations.   10

c. Discuss in brief the output analysis for steady state simulations.   6

10 a. Generate a model for validation and verification model in system simulations.   10

b. Describe 3-step approach to validation by Naylor and Finger.   10

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