Tribhuvan University
Institute of Science and Technology
2067
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Bachelor Level/ Third Year/ Fifth Semester/ Science — Full Marks: 60
Computer Science and Information Technology (CSc. 302) — Pass Marks: 24
(Simulation and Modeling) — Time: 3 hours.

Candidates are required to give their answer in their own words as for as practicable.
The figures in the margin indicate full marks

Group A

Long Answer Questions:
Attempt any two questions. **(2×10=20)**

1. What is model? What are the different types of models? Give example for each.

2. What do you mean by Queuing system? Explain the characteristics of Queuing system with example.

3. Explain the independence test. A sequence of 1000 four digit numbers has been generated and an analysis indicates the following combinations and frequencies.

Combination (i)	Observed frequency (Oi)
Four different digits	560
One pair	394
Two pairs	32
Three digits of a kind	13
Four digits of a kind	1
	1000

Based on poker test, test whether these numbers are independent. Use $\alpha = 0.05$ and N = 4 is 9.49.

Group B

Short Answer Questions:
Attempt any eight questions. **(8×5=40)**

4. What are the advantages and disadvantages of simulation?

5. What do you mean by Pseudo random numbers?

6. Explain non-uniform random number generation.

7. Define a Markov chains and its application.

8. Use the linear congruential method to generate a sequence of three two-digit random integers. Let $X_0 = 29$, a = 9, c = 49 and m = 100

9. Why do we use verification and validation in simulation?

10. Explain the data and control statement in CSMP.

11. Explain the iterative process of calibrating a model.

12. Write short notes on:
    a) GPSS
    b) Server Utilization

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Group A

Long Answer Questions:
Attempt any two questions. **(2×10=20)**

1. Differentiate between dynamic physical models and static physical models with example.

2. Define the queuing system. Explain the elements of queuing system with example.

3. What is the main objective of gap test? Explain gap test algorithm with example.

Group B

Short Answer Questions:
Attempt any eight questions. **(8×5=40)**

4. Differentiate between discrete and continuous system.

5. What do you mean by Multi Server Queues?

6. What are the key features of Markov Chains?

7. Explain the congruence method of generating random numbers.

8. What do you mean by calibration and validation of models?

9. What are the Kendall notation of Queuing System?

10. What do you mean by Hybrid Simulation?

11. Use the mixed congruential method to generate a sequence of three two digit random numbers with Xo = 37, a = 7, c = 29 and m = 100.

12. Explain GPSS with example.

13. Write short notes on:
    a) Replication of Runs
    b) Simulation tools.

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Group A

Long Answer Questions:
Attempt any two questions. **(2×10=20)**

1. Define simulation. What are the various steps in simulation study? Explain.

2. Explain Markov Chains with example.

3. What are the properties of random number? The sequence of numbers 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated. Use the Kolmogorov – Smirnov test $\alpha = 0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval 0 to 1 can be rejected. (Note that the critical value of D for $\alpha = 0.05$ and $N = 5$ is 0.565).

Group B

Short Answer Questions:
Attempt any eight questions. **(8×5=40)**

4. When is simulation appropriate and when it is not?

5. What do you mean by server utilization?

6. What do you mean by non-uniform random number?

7. Why an auto-correlation test is needed in random number?

8. What do you mean by calibration and validation?

9. When is estimation method appropriate? Explain.

10. Explain Hybrid simulation with example.

11. Use the multiplicative congruential method to generate a sequence of four three-digit random numbers. Let $r_0 = 118$, $a = 4$ and $m = 1000$.

12. Explain the distributed lag model.

13. Write short notes on:
    a) Queuing discipline
    b) CSMP

