

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is a model? Explain different types of model with suitable example. 8
b) Explain various principles used in modelling. 7
2. a) What do you understand by time-advance mechanism? Explain its types briefly. 7
b) What are the advantages and disadvantages of Monte Carlo method? Estimate the value of pi using Monte Carlo method. 8
3. a) Describe the importance of partial differential equations in simulation. Explain hybrid computers. 8
b) Simulate Autopilot system and write CSMP code for it. 7
4. a) When line is busy or link is not available, call cannot be connected and hence the call gets lost. Explain the scenario with the states involving each condition. 8
b) How are utilization and occupancy measured in simulation? Explain with reference to telephone system. 7
5. a) A quality control chart has been maintained for the weights of paint cans taken from a conveyor belt at a fixed point in a production line. Sixteen (16) weights obtained today, in order of time, are as follows: 8

68.2 71.6 69.3 71.6 70.4 65.0 63.6 64.7
65.3 64.2 67.6 68.6 66.8 68.9 66.8 70.1

Use the run test, at approximately a 0.015 level, to determine whether the weights of the paint cans on the conveyor belt deviate from randomness. [Given: $Z_{0.025}=1.96$]

- b) What are the two desired properties of pseudo random numbers? 7
Generate random numbers using Linear Congruential method with $x_1=27$,

$a=17$, $c=43$ and $m=100$ and test their uniformity using Kolmogorov Smirnov test with 5% level of significant. [Given: $D_{0.05}=0.565$]

6. a) Explain different types of BLOCKS in GPSS.
b) Why do we need analysis of simulation output? Explain the replication of run.
7. Write short notes on: (Any two)
 - a) Real Time Simulation
 - b) Elimination of Initial bias
 - c) Components of queuing system

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling

Semester: Spring

Year : 2019
Full Marks: 100
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Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is system environment? Explain with reference to open and close system? 7
b) Why Monte-Carlo method is best method for computing static model? 8
Use it to solve $\int_2^5 x^2 \cdot dx$ using twenty samples.
2. a) What do you understand by time advancement mechanism? Explain its types briefly. 7
b) What are the steps to be taken in simulation? Explain with neat diagram. 8
3. a) Explain Predator Prey Model with example. 8
b) When there is no line available or all the links are busy calls get lost. 7
Show all the necessary steps for block and busy condition in telephone call simulation.
4. a) What are the various components and organization of a discrete system? Explain them. 7
b) If same process is repeated for multiple runs, which of the analysis method is used and how? 8
5. a) The following numbers have been generated 0.39, 0.67, 0.78, and 0.55. Use the Kolmogorov-Smirnov Test to check whether given numbers are uniformly distributed or not. (Use the critical value of D for $\alpha = 0.05$ and $N=5$ is 0.565.) 7
b) The two Digit random numbers generated by a multiplicative congruential method are given below. Test these data for uniform distribution using Chi-square. Is it acceptable at 95% confidence level? (Use $\chi^2_{0.05,9}=16.9$) 8
36, 91, 51, 02, 54, 06, 58,
06, 58, 02, 54, 01, 48, 97, 43, 22,
83, 25, 79, 95, 42, 87, 73, 17, 02,
42, 95, 38, 79, 29, 65, 09, 55, 97,
39, 83, 31, 77, 17, 62, 03, 49, 90,

37, 13, 17, 58, 11, 51, 92, 33, 78,
21, 66, 09, 54, 49, 90, 35, 84, 26,
74, 22, 62, 12, 90, 36, 83, 32, 75,
31, 94, 34, 87, 40, 07, 58, 05,
56, 22, 58, 77, 71, 10, 73, 23, 57, 13,
36, 89, 22, 68, 02, 44, 99, 27,
81, 26, 85, 22

6.
 - a) Why is analysis of simulation output necessary? How is it done in replication of run?
 - b) Write SIMSCRIPT code for arrival routine of telephone call simulation.
7. Write short notes on: (Any two)
 - a) Feedback System
 - b) Differential Equations
 - c) Measure of queuing system

POKHARA UNIVERSITY

Level: Bachelor
Programme: B E
Course: Simulation and Modeling

Semester: Fall

Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is Simulation and Model? Explain various models that are involved while simulating system. 7
b) How performance of a single server queue can be measured? Explain in detail. 8
2. a) Explain the numerical computation techniques for continuous Model. 7
b) Draw the cobweb model (in graph) for : 8
 - i) Fluctuation of market price.
 - ii) Cobweb model for market economy graph from given data.
 $D = 12.4 - 1.2 P$, $S = 8.0 - 0.6 P_1$, $D = S$, $P_0 = 1.0$
3. a) What is an analog method? Design an analog computer for human liver. The equations for human liver are 7
$$\frac{dx_1}{dt} = -k_{12} x_1 + k_{21} x_2$$
$$\frac{dx_2}{dt} = k_{12} x_1 - (k_{21} + k_{23}) x_2$$
$$\frac{dx_3}{dt} = k_{23} x_2$$

b) Explain about the simulation of an automobile wheel with CSMP III program for it. 8
4. a) How is statistics gathered in simulation? Explain with reference to telephone system. 8
b) Calls are lost when lines are busy or link is not free. Explain various steps involved to simulate this system. 7
5. a) Define pseudo random numbers. The following numbers have been generated 0.44, 0.19, 0.88, 0.27, 0.55, 0.13, 0.63, 0.74, 0.11 and 0.33. 7
Use the Kolmogorov-Smirnov Test with $\alpha = 0.05$ to determine, if the

hypothesis that the numbers are uniformly distributed on interval $[0, 1]$ can be rejected. [Use the critical value of D for $\alpha = 0.05$ and $N = 10$ is 0.410.]

- b) A sequence of random numbers is given below. Use chi-square test with $\alpha = 0.05$ to test whether these numbers are serially auto correlated. (Use $\chi^2_{0.05, 7} = 14.067$) 8

49, 95, 82, 19, 41, 31, 12, 53, 62, 40, 87, 83, 26, 01, 91, 55, 38, 75, 90,
35, 71, 57, 27, 85, 52, 08, 35, 57, 88, 38, 77, 86, 29, 18, 09, 96, 58,
22, 08, 93, 85, 45, 79, 68, 20, 11, 78, 93, 21, 13, 06, 32, 63, 79, 54,
67, 35, 18, 81, 40, 62, 13, 76, 74, 76, 45, 29, 36, 80, 78, 95, 25, 52.

6. a) What are DSSLs? Explain GPSS with example to solve discrete system problem. 8
b) Write a SIMSCRIPT program for MAIN routine of the telephone system 7
7. Write short notes on: (Any two) 2×5
a) Elimination of initial bias.
b) Replication of Run.
c) Differential Equations.

POKHARA UNIVERSITY

Level: Bachelor

Semester – Spring

Year: 2020

Program: BE

Full Marks: 70

Course: Simulation and Modeling

Pass Marks: 31.5

Time: 2 hrs.

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

Attempt all the questions.

Group - A: (5×10=50)

- Q. N. 1 Why simulation is better option for the study of the System? Justify "Simulation is termed as The Last Resort". Monte Carlo Method is used for deterministic bodies. Justify with example. 2+3+5
- Q. N. 2 Write down the significance of differential equations. Explain the analog computer model of liver with necessary equations and diagrams. 4+6

OR

Design an analog computer of following:

6+4

$$d^2x/dt^2 + a(dx/dt)^2 + by = 100 \dots\dots(i)$$

$$d^2y/dt^2 + c(dy/dt) + dz = 20 \dots\dots(ii)$$

$$dz/dt = ax + cy - dz \dots\dots(iii)$$

Where a & b = first two digits of your symbol number and c & d = last two digits of your symbol number.

Also, Explain the components used in above design.

- Q. N. 3 Differentiate between Static Mathematical Model and Dynamic Mathematical model with suitable examples. 10
- Q. N. 4 Compare and contrast lost and busy call of simulation of telephone call. Among these lost call and busy call, which one is best? Justify with example. 10
- Q. N. 5 Compare and contrast simulation run statistics and replication of run. 5+5

Group - B: (1×20=20)

- Q. N. 6 a) There are 48 people in an institute studying programming. They all started writing a program at the same time. It takes each student 15 ± 3 minutes to the program. Only 35% of the program will run correctly for the first time. When the program has an error it takes 4 ± 2.5 minutes to do the debugging. After debugging only 35% of the program will run successfully. How long does it take for whole class to finish every one's program correctly? Simulate the given program with block diagram and GPSS code. 10
- b) What is the difference between the Kolmogorov Smirnov test and the chi-squared test? At what situation these two tests are used? Explain with example. 10

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Fall

Year : 2021
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3hrs.

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The figures in the margin indicate full marks.

Attempt all the questions.

1. a) "Before system simulation, it is necessary to predict how a system performs its activities". Explain this with the principles of system modeling. 7
b) Why do we need the Monte-Carlo method of simulation? Estimate the value of π using Monte-Carlo simulation. Use 15 iterations to generate numbers. Compare your result with its known value up to 3 decimal places. 8
2. a) Discuss about continuous system Simulation Language (CSSL). Explain different components of analog methods. 8
b) Draw the Cobweb model (in graph) for market economy graph from the given data 7
 $D = 12.4 - 1.2P$
 $S = 8.0 - 0.6P_1$
 $D = S$ and $P_0 = 1.0$
3. a) Write a program in CSMP III for the RLC circuit model given by the following differential equation (variable and constants have their appropriate meaning). 8
$$Mx'' + Dx' + Kx = KF(t)$$

Where $M = 2.0$, $F = 1.0$ and $K = 400.0$. Make your necessary assumptions if required.
b) What is the significance of lost calls in a telephone system simulation? How do you measure the utilization and occupancy of a link in telephone system simulation? Explain 7
4. a) Why do we need to gather statistics in discrete system simulation? Explain the recording distribution and transit time. 7

b) How do you generate arrival pattern using bootstrap sampling? Illustrate. 8

5. a) For the given sequence of random numbers, can the hypothesis that the numbers are rejected on the basis of length of runs up and down at $\alpha = 0.05$? 8

0.41	0.68	0.89	0.94	0.74	0.91	0.55	0.62	0.36	0.27
0.19	0.72	0.75	0.08	0.54	0.02	0.01	0.36	0.16	0.28
0.18	0.01	0.95	0.69	0.18	0.47	0.23	0.32	0.82	0.53
0.31	0.42	0.73	0.04	0.83	0.45	0.13	0.57	0.63	0.29
0.41	0.68	0.89	0.94	0.74	0.91	0.55	0.62	0.36	0.27
0.19	0.72	0.75	0.08	0.54	0.02	0.01	0.36	0.16	0.28
0.18	0.01	0.95	0.69	0.18	0.47	0.23	0.32	0.82	0.53
0.31	0.42	0.73	0.04	0.83	0.45	0.13	0.57	0.63	0.29

b) How do you define random numbers in the domain of computation? Explain with a random number generation algorithm 7

6. a) A parts manufacturing shop is turning out parts at the rate of one every 5 minutes. As they are finished, the parts got to the inspectors, who take 4 ± 3 minutes to examine each one and rejects about 10% of the parts. There are three inspectors. During examination, the parts are put on a conveyer, which carries the parts to the inspectors and takes defined interval of time in between. It takes 2 minutes for a part to reach the first inspector; if he is free at the time of part arrives, he takes it for inspection. If he is busy at that time, the part takes a further 2 minutes to reach the second inspector who will take the part if he is not busy. Parts that pass the second inspector may get picked up by the third inspector, who is a further 2 minutes along the conveyer belt; otherwise they are lost. Each part will be represented by one transaction and the time unit selected for the problem will be 1 minute. 8

Write a GPSS block diagrams and a program for the system.

b) How do you define the initial bias in a system simulation? How does the replication of runs help to minimize it? 7

7. Write short notes on: (Any two) 2x5

- Estimation Methods
- Digital-Analog Simulator
- Queuing system

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Programme: BCA

Course: Simulation and Modeling

Year : 2024

Full Marks : 100

Pass Marks : 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain various principles used in modelling. 8
b) What do you mean by Monte Carlo method? Estimate the value of $\int_2^4 (4x) dx$ using monte carol method. 7
2. a) Define differential equation. Explain why it is required in continuous system simulation. Explain the types of differential equation with example. 8
b) Define analog computer with its components in detail. Draw and explain a block diagram using analog method for solving the analog computer model for liver. 7
3. a) Explain the concept of a feedback system in detail and illustrate its working with the example of an autopilot system in an aircraft. 8
b) Explain the scenario involving conditions like: When line is busy or link is not available, call cannot be connected and then call gets lost. 7
4. a) Describe why gathering of statistics is necessary, with 6 commonly needed statistics? Explain how measurement of utilization and occupancy is done. 8
b) What the consequences of properties of random numbers. Explain the runs Test of random numbers with suitable example. 7
5. a) Define GPSS. Explain the SIMSCRIPT execution cycle. 7
b) Workers come to a supply store at the rate of one every 8 ± 4 minute. Their requisitions are processed by one of the two clerks who take 10 ± 5 minutes for each requisition. The requisitions are then passed to a single storekeeper who fills them one at time, taking 8 ± 3 minutes for each request. Draw the GPSS block diagram to simulate the queue of workers and measure the distribution of time taken for 700 requisitions to be filled. 8
6. a) What is analysis of simulation output? Explain the simulation run statistics. 7
b) What is the importance of analysis of simulation output? Describe replication of run. 8
7. Write short notes on: (Any two) 2×5
a) Queue discipline
b) Predator Prey model
c) Mid-Square random number generator

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling

Semester: Fall

Year : 2025
Full Marks : 100
Pass Marks : 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What is simulation? "Simulation is not always appropriate", Justify this statement with relevant examples. 8
- b) Find the value of π using Monte Carlo method. 7
2. a) What are the steps involved in computer simulation? Explain with neat diagram. 8
- b) Derive and write the CSMF-III program for Predator-Prey model. 7
3. a) List the advantage and disadvantage of analog simulation. Draw the suitable analog computer model for the following set of differential equations. 8

$$\frac{dx_1}{dt} = -k_1 x_1 + k_2 x_2$$

$$\frac{dx_2}{dt} = -k_1 x_1 - (k_2 + k_3) x_2$$

$$\frac{dx_3}{dt} = k_3 x_2$$
- b) What is the significance of incorporating delayed calls in a telephone system simulation? Provide a detailed description of the simulation involving these delayed calls and how they impact the overall system performance. 7
4. a) Why do you think that Time advancement Mechanism is necessary in simulation study? How can it be implemented in simulation? 8
- b) The following numbers have been generated 0.54, 0.73, 0.98, 0.11 and 0.68. Use KS test to check whether given numbers are uniformly distributed or not at 95% confidence interval. 7
5. a) Use Runs up and runs down test to determine the following sequence of number can be accepted or rejected on hypothesis of independence where $\alpha=0.05$. 8

0.34	0.90	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.79	0.64	0.70	0.81	0.94	0.74	0.22	0.74
0.96	0.99	0.77	0.67	0.56	0.41	0.52	0.73	0.99	0.02
0.47	0.30	0.17	0.82	0.56	0.05	0.45	0.31	0.78	0.05
0.79	0.71	0.23	0.19	0.82	0.93	0.65	0.37	0.39	0.42
0.99	0.17	0.99	0.46	0.05	0.66	0.10	0.42	0.18	0.49

- b) Define SIMSCRIPT program. Explain organization of SIMSCRIPT statement. 7
6. a) A parts manufacturing shop is turning out parts at the rate of one every 5 minutes. As they are finished, the parts go to the inspectors, who take 4 ± 3 minutes to examine each one and rejects about 10% of the parts. There are three inspectors. During examination, the parts are put on a conveyor, which carries the parts to the inspectors and takes defined interval of time in between. It takes 2 minutes for a part to reach the first inspector; if he is free at the time of part arrives, he takes it for inspection. If he is busy at that time, the part takes a further 2 minutes to reach the second inspector who will take the part if he is not busy. Parts that pass the second inspector may get picked up by the third inspector, who is a further 2 minutes along the conveyor belt; otherwise, they are lost. Each part will be represented by one transaction and the time unit selected for the problem will be 1 minute. 8
- Write a GPSS block diagrams and a program for the system.
- b) How does initial bias make an adverse effect? Discuss about the process of eliminating initial bias effect. 7
7. Write short notes on: (Any two) 2*5
 - a) Replication of run
 - b) Queuing System
 - c) Generation of arrival patterns

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modelling

Semester: Spring

Year : 2021
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Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

- a) What is Simulation and Model? Explain about the areas where simulation can be applied. 7
- b) Can you estimate the value of π ? Explain its method and steps for estimation. 8
- a) What do you mean by time advance mechanism? Differentiate between next event and fixed increment time advance mechanism. 7
- b) Describe in brief predator prey model. Explain the structure of CSMP III. 4+4
- a) How nonlinear differential equation can be used to represent continuous system? Explain with example. 7
- b) What are the various arrival patterns in representing discrete system? Explain about simulation programming task. 3+5
- a) Justify the statement "Call gets lost when link is not available or line is busy" with the help of telephone simulation system. 7
- b) A sequence of random numbers is given below. Use chi-square test with $\alpha=0.05$ to test whether these numbers are uniformly distributed and serial autocorrelation. (Use $\chi^2_{0.05,7} = 14.067$) 8
- 49, 95, 82, 19, 41, 31, 12, 53, 62, 40, 87, 83, 26, 01, 91, 55, 38, 75, 90, 35, 71, 57, 27, 85, 52, 08, 35, 57, 88, 38, 77, 86, 29, 18, 09, 96, 58, 22, 08, 93, 85, 45, 79, 68, 20, 11, 78, 93, 21, 13, 06, 32, 63, 79, 54, 67, 35, 18, 81, 40, 62, 13, 76, 74, 76, 45, 29, 36, 80, 78, 95, 25, 52.
- a) Explain the organization of SIMSCRIPT program with suitable diagram. 7
- b) Consider a factory that manufacture football taking 20 to 40 minutes. The ball is moved from the generation to the inspection machine taking 2 minutes. There are 3 inspection machines at one place and need 30 to

60 minutes for inspection and reject 30% of the football. Simulate for 1000 transaction. Draw GPSS block diagram to simulate this system.

-) How can we analyze the output that is generated from iid variables? Explain. 8
-) Replication of runs can be used to analyze the result that is generated from multiple runs. Explain in detail about it. 7

Write short notes on: (Any two)

2×5

-) Pseudo random number
-) Queue Characteristics
-) Real time Simulation

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall
Programme: BE
Course: Simulation and Modeling

Year : 2021
Full Marks: 100
Pass Marks: 45
Time :
3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) "Before system simulation, it is necessary to predict how a system performs its activities". Explain this with the principles of system modeling. 7
- b) Why do we need the Monte-Carlo method of simulation? Estimate the value of π using Monte-Carlo simulation. Use 15 iterations to generate numbers. Compare your result with its known value up to 3 decimal places. 4
2. a) Discuss about continuous system Simulation Language (CSSL). Explain different components of analog methods. 8
- b) Draw the Cobweb model (in graph) for market economy graph from the given data 7
- $D = 12.4 - 1.2P$
 $S = 8.0 - 0.6P_{-1}$
 $D = S$ and $P_0 = 1.0$
3. a) Write a program in CSMP III for the RLC circuit model given by the following differential equation (variable and constants have their appropriate meaning). 8
- $Mx'' + Dx' + Kx = KF(t)$
Where $M = 2.0$, $F = 1.0$ and $K = 400.0$. Make your necessary assumptions if required.
- b) What is the significance of lost calls in a telephone system simulation? How do you measure the utilization and occupancy of a link in telephone system simulation? Explain 7
4. a) Why do we need to gather statistics in discrete system simulation? Explain the recording distribution and transit time. 7

- b) How do you generate arrival pattern using bootstrap sampling? Illustrate.
5. a) For the given sequence of random numbers, can the hypothesis that the numbers are rejected on the basis of length of runs up and down at $\alpha = 0.05$?

0.41	0.68	0.89	0.94	0.74	0.91	0.55	0.62	0.36	0.27
0.19	0.72	0.75	0.08	0.54	0.02	0.01	0.36	0.16	0.28
0.18	0.01	0.95	0.69	0.18	0.47	0.23	0.32	0.82	0.53
0.31	0.42	0.73	0.04	0.83	0.45	0.13	0.57	0.63	0.29
0.41	0.68	0.89	0.94	0.74	0.91	0.55	0.62	0.36	0.27
0.19	0.72	0.75	0.08	0.54	0.02	0.01	0.36	0.16	0.28
0.18	0.01	0.95	0.69	0.18	0.47	0.23	0.32	0.82	0.53
0.31	0.42	0.73	0.04	0.83	0.45	0.13	0.57	0.63	0.29

- b) How do you define random numbers in the domain of computation? Explain with a random number generation algorithm
6. a) A parts manufacturing shop is turning out parts at the rate of one every 5 minutes. As they are finished, the parts got to the inspectors, who take 4 ± 3 minutes to examine each one and rejects about 10% of the parts. There are three inspectors. During examination, the parts are put on a conveyer, which carries the parts to the inspectors and takes defined interval of time in between. It takes 2 minutes for a part to reach the first inspector; if he is free at the time of part arrives, he takes it for inspection. If he is busy at that time, the part takes a further 2 minutes to reach the second inspector who will take the part if he is not busy. Parts that pass the second inspector may get picked up by the third inspector, who is a further 2 minutes along the conveyer belt; otherwise they are lost. Each part will be represented by one transaction and the time unit selected for the problem will be 1 minute.
- Write a GPSS block diagrams and a program for the system.
- b) How do you define the initial bias in a system simulation? How does the replication of runs help to minimize it?
7. Write short notes on: (Any two)
- Estimation Methods
 - Digital-Analog Simulator
 - Queuing system

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2022

Programme: BE

Full Marks: 100

Course: Simulation and Modelling

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is a model? How system can be represented in various model? Explain with example. 7
b) Why Monte-Carlo method is best method for computing static model? Use it to solve $\int_0^3 \sqrt{1+x^3} dx$ using 10 samples. Also estimate the error percentage. 8
2. a) Draw the cobweb model in graph for: 8
i) Fluctuation of market price.
ii) Cobweb model for market economy graph from given data.
 $D=12.4 - 1.2P$, $S=7.0 - 0.6P$, $P_1, D=S, P_0=1.0$
b) Differentiate between continuous and discrete system. Design an analog computer for automobile suspension wheel. 7
3. a) What is CSSL and why were they developed? Explain the structure of CSMP III. 8
b) What are the various types of calls? Simulate telephone system for lost call system. 7
4. a) Why do you think that Time advancement Mechanism is necessary in simulation study? How can it be implemented in simulation? 8
b) The following numbers have been generated 0.54, 0.73, 0.98, 0.11 and 0.68. Use KS test to check whether given numbers are uniformity distributed or not at 95% confidence interval. 7
5. a) Using chi-square test with $\alpha = 0.05$, Check for the uniformity of the given random no. 8

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

- b) Which section is used to declare the variables, entities and routines in SIMSCRIPT language? Declare variables entities and routines of telephone call simulation in the section. 7
6. a) Explain about facility and storage entity with reference to manufacturing shop. 8
- b) How does initial bias make an adverse effect? Discuss about the process of eliminating initial bias effect. 7
7. Write short notes on: (Any two) 2×5
- a) Utilization and occupancy
- b) Replication of run
- c) Predator pray model

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

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Attempt all the questions.

1. a) Describe in brief the different types of simulation models. Taking an example of any realistic simulation problem, illustrate the concepts of system boundary, environment, entities, endogenous and exogenous activities. 8
b) Solve the following using Monte Carlo Simulation. Use 15 iteration to generate the number. Also estimate the error percentage. 7
$$I = \int_0^{\pi/2} \sin x \cos x \, dx$$
2. a) Compare simulation and analytical methods with example. 8
b) Define differential equation. Explain why it is required in continuous system simulation. Explain the types of differential equation with example. 7
3. a) Derive and write the CSMP-III program for Predator-Prey model. 8
b) What is the significance of incorporating delayed calls in a telephone system simulation? Provide a detailed description of the simulation involving these delayed calls and how they impact the overall system performance. 7
4. a) Explain different gathering statistics the counter and summary statistics and the measuring utilization and occupancy. 7
b) Use the Kolmogorov-Smirnov test to determine whether the given sequence is a sequence of uniform random numbers at 95% level of significance. 8
0.26, 0.66, 0.75, 0.58, 0.61, 0.98, 0.31, 0.90, 0.88, 0.65

5. a) From the below given Random numbers check its uniformity using chi-square method for 95% accuracy. 7

(Use standard table for appropriate value.)

194 128 130 179 176 181 138 180 128 134 139 119 160 101 142 145
182 193 186 145 130 150 186 158 104 102 106 148 102 139 160 121
170 100 121 159 132 176 133 183 156 125 173 105 195 137 106 171
193 108 185 134 195 155 124 189 197 158 167 105 130 161 192 130
195 164 107 177 134 178 102 169 112 176 106 157 139 150 193 181
164 136 109 171 155 129 114 118 133 131

- b) A machine tool in a manufacturing shop is turning out parts at a rate of one every 8 minutes. As they are finished, the parts go to an inspector, who takes 6 ± 3 minutes to examine each one and rejects about 20 % of the parts. The rejected parts are then sent for further refinement. Reworking takes 10 ± 3 minutes. After correction all the parts are resubmitted for inspector. Simulate for 500 parts to be completed. Draw GPSS block diagram and write GPSS code. 8

6. a) Define SIMSCRIPT program. Explain organization of SIMSCRIPT statement. 7

- b) How would you use replication of runs to calculate means, variances and confidence intervals of output parameters? Describe. 8

7. Write short notes on: (Any two)

- a) Elimination of initial bias
- b) Generation of arrival patterns
- c) Queuing System

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling

Semester: Fall

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the different components of system with example. Write down the advantages and disadvantages of simulation. 4+4
b) Estimate the value of $\int_2^5 x^2 dx$ using Monte Carlo method. 7
2. a) Cobweb Model can be used as an economic tool for analyzing the dynamics of supply and demand in market. Verify the statement. 7
b) Illustrate how continuous system simulation can be used to represent real world problems using nonlinear differential equation. 8
3. a) What are the advantages and limitations of analog computers compared to digital? Discuss the fundamental components involved in analog computer design and draw analog computer for mechanical system. 7
b) Use the chi-square test with $\alpha=0.05$ to test whether the data shown below are uniformly distributed. Critical value for $n=10$ is 16.9. 8

0.34	0.90	0.25	0.89	0.87	0.44	0.12	0.21	0.46	0.67
0.83	0.76	0.79	0.64	0.70	0.81	0.94	0.74	0.22	0.74
0.96	0.99	0.77	0.67	0.56	0.41	0.52	0.73	0.99	0.02
0.47	0.30	0.17	0.82	0.56	0.05	0.45	0.31	0.78	0.05
0.79	0.71	0.23	0.19	0.82	0.93	0.65	0.37	0.39	0.42
0.99	0.17	0.99	0.46	0.05	0.66	0.10	0.42	0.18	0.49
0.37	0.51	0.54	0.01	0.81	0.28	0.69	0.34	0.75	0.49
0.72	0.43	0.56	0.97	0.30	0.94	0.96	0.58	0.73	0.05
0.06	0.39	0.84	0.24	0.40	0.64	0.40	0.19	0.79	0.62
0.18	0.26	0.97	0.88	0.64	0.47	0.60	0.11	0.29	0.78
4. a) How do you handle lost call in telephone simulation. Explain with necessary figures. 7
b) What is utilization and occupancy? How are they measured? Explain with examples. 8
5. a) Explain the organization of SIMSCRIPT program with suitable diagram. 7

- b) Write GPSS block diagram for manufacturing shop model where there is single inspector and single transaction can be handled at a time. 8
6. a) Discuss the role of replication of runs in analysis of output for simulation and modeling. 8
- b) What kind of outputs are obtained in simulation and modeling? Explain in detail. 7
7. Write short notes on: (Any two) 2×5
- a) Generation of arrival patterns
 - b) Real Time Simulation
 - c) Single server queing system

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling

Semester: Fall

Year : 2024
Full Marks : 100
Pass Marks : 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) ✓ Define Simulation and Modeling with example. Explain the applications in detail. 7
b) ✓ Draw the Cobweb model for following equation: 8
$$D=12.4-1.2P$$
$$S=8.0-0.6P_{-1}$$
$$D=S \text{ and } P_0=1.0$$
2. a) ✓ How Monte Carlo method is used in solving real-world problems? Explain it and use it to determine the value of pi. 8
b) ✓ Why we need differential equations in modeling? Explain the statements of CSMP III. 7
3. a) ✓ What is a continuous system? Design an analog computer for an wheel suspension system. 7
b) ✓ What are the various types of calls? Simulate the telephone system for lost call system. 8
4. a) ✓ How are utilization and occupancy measured in discrete system simulation? Explain with a suitable example. 8
b) ✓ What are the major drawbacks of the mid square method to generate random numbers? Generate ten 4-digits random numbers using mid square method with seed value 4765. 7
5. a) ✓ Explain the methods of independence test of random numbers. 8
b) ✓ How discrete system can be solved using GPSS? Explain about the blocks used to represent action times and facilities and storages. 7
6. a) ✓ Explain the structure and organization of SIMSCRIPT language. 8
b) ✓ Why is output analysis necessary? How is it done using the replication of runs method? 7

7. Write short notes on: (Any two)

2x3

- a) Cobweb Model**
- b) Partial Differential Equations**
- c) Nature of Problem**

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Simulation and Modeling (New)

Semester: Spring

Year : 2025
Full Marks : 100
Pass Marks : 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define simulation and modeling. Explain the different component of the system. 7
- b) Explain how we can compute the given integral using Monte Carlo method. Use it to find the value of π . 8
2. a) Draw a Cobweb model to investigate a market in which the supply and demand functions are same. 7
 $D=12.4-1.2P$
 $S=1.0+0.9P_{-1}$
 $P_0=1.0$
- b) Consider a sample of 16 data points 0.15, 0.32, 0.48, 0.74, 0.22, 0.91, 0.63, 0.08, 0.55, 0.39, 0.27, 0.83, 0.17, 0.70, 0.44, 0.98. Perform a Kolmogorov-Smirnov (KS) test to determine if the sample follows a uniform distribution. Use a significance level of $\alpha=0.05$. 8

OR

- What are the properties of random numbers? Generate seven 4-digit random numbers using the linear congruential generation method.
3. a) Explain Linear and nonlinear differential equation. Write CSMP III code for automobile suspension system. 7
 - b) Write differential equation of automobile suspension wheel system and draw analog computer for it. 8
 4. a) What are the various types of calls? Simulate the telephone system for delayed call system. 7
 - b) What is discrete system simulation? How are utilization and occupancy measured in discrete system simulation? Explain with a suitable example. 8

OR

Differentiate Next event oriented and Fixed increment time advance mechanism.

5. a) Explain gap test and poker test to check the independence of random numbers. 7
- b) Explain the organization of SIMSCRIPT language with suitable example. 8
6. a) Write GPSS code for manufacturing shop model with necessary assumptions also draw the block diagram. 7
- b) Why is elimination of initial bias important? What are various nature of problems in simulation. 8
7. Write short notes on: (Any two) 2×5
 - a) Steps of Simulation
 - b) Real time Simulation
 - c) Elimination of Initial Bias

POKHARA UNIVERSITY
SCHOOL OF ENGINEERING

Level: Bachelor
Programme: Software VI
Course: Simulation & Modelling

Semester -Fall

Year : 2025
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Simulation and Modelling? What are the various Components of system? Explain each of them.
b) Draw the cobweb model for the following equation:
 $D=12.4-1.2P$
 $S=1.0+0.9P_n$
 $P_0=1.0$
2. a) Solve $I = \int_0^1 \frac{x^3}{1+x^2} dx$ by using Monte Carlo Method. Use 15 iteration to generate the number. Also estimate the error percentage.
b) Explain the various components of Analog Computer? Draw the analog computer for Human Liver system.
3. a) Why Delayed call is needed? Explain telephone system simulation with BUSY call.
b) Define Linear & partial differential equation with an example. Write CSMP III codes for Wheel suspension system.
4. a) Differentiate between fixed and next time advance mechanism.
OR
Differentiate between occupancy and utilization in system simulation. Also mention the mathematical expressions of each.
b) Explain Run and Gap test used in independence tests during simulation.

- a) Employ the Linear congruential generator, to generate a sequence of 10 random numbers given $r_1=987$, $r_2=535$ and modulo $m=1000$. Perform KS Test to check uniformity of the random under 95% confidence interval.

OR

Using the Middle Square Method, generate a sequence of 5 random numbers starting with the seed $S_0=5731$. Ensure each step uses the middle 4 digits of the squared number. Explain whether the method demonstrates randomness or suffers from any issues.

- b) In a manufacturing shop, a machine tools turns out parts at the rate of one every five minutes. As they are finished the parts go to inspector, who takes 5 ± 2 minutes to examine each part and rejects 10% of parts. Each part will be represented by one transaction and time unit selected for problem will be one minute. Simulate for 100 parts to leave the system. Write a GPSS code also draw a diagram for the above scenario.

- a) Define SIMSCRIPT program. Write Simscript program for bank queuing system with necessary assumptions.
- b) What is replication of run? mention the problems occurred during Simulation Run Statistics with explanation of each.

Write short notes on any two:

- a) Elimination of initial bias
- b) Predator Prey Model
- c) Interactive System