

Modelling and Simulation (CS620)

Question: 1 (Marks: 1)

A simulation is the imitation of the operation of a real-world process or system over time

Choices:

Imaginary word process

Real-world process

Both A & B

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Question: 2 (Marks: 1)

Agent-based methods may be particularly valuable in thesciences.

Choices:

biological

social

physical

none

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Question: 3 (Marks: 1)

Cognitive Agent-based Computing Framework by Niazi andpresents detailed instructions on how to build Agent-based Models

Choices:

ahmad

rehman

hussain

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Question: 4 (Marks: 1)

_____ is a numerical computational technique used in conjunction with dynamic mathematical models.

Choices:

Analysis

System Simulation

Dynamic Computation

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Question: 5 (Marks: 1)

Which model follows the changes over time that results from the system activities.

Choices:

Dynamic Model



Static Model



Analytical Model



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Question: 6 (Marks: 1)

Which model in system modeling depicts the dynamic behavior of the system?

Choices:

Context Model

Behavioral Model

Data Model

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Question: 7 (Marks: 1)

Which model in system modeling depicts the static nature of the system?

Choices:

Behavioral Model

Context Model

Data Model

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Structural Model -_/

Question: 8 (Marks: 1)

_____ can sometimes present new phenomena that are not necessarily about some real-world phenomenon but are thought experiments on possible computations.

Choices:

Agent

Event

Model

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Activity

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Question: 9 (Marks: 1)

Emergent phenomena can be described as existing on at least ____ levels.

Choices:

Two



Three



Four



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Question: 10 (Marks: 1)

_____ is a collection of entities that interact together over time to accomplish one or more goals.

Choices:

System



Model



Simulation



Activities

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Question: 11 (Marks: 1)

NetLogo calls its prototypical agent a _____.

Choices:

Turtle



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Patches



Links

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Question: 12 (Marks: 1)

_____ is define as a system that are composed of multiple individual elements that interact with each other.

Choices:

Complex System

Agent-based System

Cognitive System

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Question: 13 (Marks: 1)

_____ network in which each node is randomly connected to other individual node.

Choices:

Lattice

Random

Scale-free

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Question: 14 (Marks: 1)

Model accuracy is evaluated through _____.

Choices:

Validation and Verification

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Verification and Replication

Replication and Validation

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Question: **15** (Marks: 1)

_____ levels of agent-based modeling is present in CABC framework.

Choices:

Two



Three



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Question: **16** (Marks: 1)

The linear congruential method produces the sequence of integers between _____.

Choices:

0 and 1

0 and $m-1$

m and 1

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0 and m

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Question: 17 (Marks: 1)

_____ distribution operates on acceptance rejection technique.

Choices:

Binomial distribution



Triangular distribution



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Question: **18** (Marks: 1)

To analyze the output data _____ process is used.

Choices:

Validation



Verification



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Question: 19 (Marks: 1)

An entity of interest in our system is describe by an/a _____.

Choices:

Activity



Event



Agent



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Question: 20 (Marks: 1)

Find the incorrect statement for randomness.

Choices:

Randomness is a property of an event and its reoccurrence.

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Realization of the property of independence.

Randomness have no pattern.

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Question: **21** (Marks: 1)

Trade off is necessary in performance to save _____.

Choices:

Cost

Time

Resources

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Question: 22 (Marks: 1)

_____ is defined as a relationship between independent variable x and a dependent variable y .

Choices:

Lineare Correlation



Linear Regression



QuadRACTic Regression



Nonlinear Correlation

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Question: 23 (Marks: 1)

_____ can connect a device from anywhere.

Choices:

CAN



VAN



SAN



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Question: 24 (Marks: 1)

_____ distribution was created on the physical basis.

Choices:

Beta



Gamma



Binomial



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Question: 25 (Marks: 1)

_____ equation used in triangular distribution

Choices:

$a \leq b \leq c$



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$a \leq c \leq b$



$a \leq c \geq b$



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Question: 26 (Marks: 1)

Deterministic system that is difficult to predict is known as _____

Choices:

Discrete

Adaptive

Chaotic

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Question: 27 (Marks: 1)

_____ is the of finding the parameters and initial conditions that cause the model to match with real world data.

Choices:

Calibration



Replication



Validation



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Question: 28 (Marks: 1)

The major goal of _____ is to focus on explaining and summarizing a specific dataset.

Choices:

probability



Mathematics



Descriptive Statistics

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Choices:

Artificial Machine learning



Acute Machine learning



Acute Mechanical Leptitude



None

Which system/model applies computational procedures to solve equations

Choices:

Dynamic Model

Static Model

Analytical Model

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Question: **31** (Marks: 1)

A precise statement of components to be used and the relationships among them

Choices:

Formal Model

Informal Model

Simulated Model

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Question: 32 (Marks: 1)

If some of the detected faults are not removed with certainty or new faults introduced during debugging process then it is called _____.

Choices:

Incomplete perfect Debugging

Perfect Debugging

Imperfect Debugging

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Question: 33 (Marks: 1)

In modelling and simulations, useful statistical models have

Choices:

Inventory and maintainability

Limited data

Queueing system

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All of these

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Question: 34 (Marks: 1)

A _____ is the model of an application that the designers want users to understand.

Choices:

- conceptual model
- Computational Model
- Dynamic Model

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Question: 35 (Marks: 1)

If two-sample-t confidence interval approach is used. The point estimate of the ____ difference is:

Choices:

Mean

Average

Variance

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Question: 36 (Marks: 1)

The _____ of the customers in a queue and determining that which customer should come for service when the server is free

Choices:

Logical ordering



Customized ordering



Simulated ordering

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Question: 37 (Marks: 1)

An original model and replicated model can differ across at least six dimensions. Which of the following is not part of this six dimensions

- I.Time
- II.Hardware
- III.Languages
- IV.Toolkits
- V.Algorithms
- VI.Authors

Choices:

I

II, III, VI

VI, V

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Question: 38 (Marks: 1)

When you are trying to collect statistical results from an ABM you should run the model _____ and collect different results at different points

Choices:

Multiple times

Once

Two times

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Question: 39 (Marks: 1)

What is the primary difference between finite and infinite population models in queuing theory?

Choices:

Service rate

Arrival rate

Queue length

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Question: 40 (Marks: 1)

What are the characteristics of the Linear Congruential Method (LCM) for generating random numbers?

Choices:

Produces sequences with shorter periods, yields real numbers, and is rarely used.

Yields sequences with longer periods, produces the sequence of integers, and is widely used.

Produces sequences with longer periods, yields real numbers, and is moderately used.

Yields sequences with shorter periods, produces the sequence of integers, and is rarely used.

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@TechnLearn_1 5 months ago (edited)

Correct answer of these mcqs are :

8: Model is correct

14: (iv) replication verification validation

16: (ii) 0 and m-1

19: (ii) event

20: (iv)

23: (iv) CAN

24: (iii) binomial

37: (iv) None

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Question: **47** (Marks: 5)

Write down a detail note on when simulation is appropriate tool and when its not an appropriate tool?

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Question: **48** (Marks: 5)

Explain Bernoulli distribution in detail?

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Question: **49** (Marks: 5)

Explain common random numbers in detail?

✓ What is the Game of Life?

It's a **computer simulation game** made by **John Conway** in 1970.

★ It's not a real "game" with players — instead, it's a **grid of cells** that live, die, or reproduce based on **simple rules**.

□ The goal is to **simulate how life behaves** (birth, survival, death) over time.

✓ How is it played?

- You have a **grid (like a chessboard)** made of tiny **cells**.
- Each cell can be:
 - **Alive** (colored)
 - **Dead** (empty)

You **start** with some cells turned ON (alive), and then you **watch** how the system evolves over **generations (steps)**.

✓ Rules of the Game of Life:

Each cell looks at its **8 neighbors** (top, bottom, left, right, and diagonals). Then:

1. ✓ **Survival:**
A living cell with **2 or 3 neighbors** stays alive.
2. ✗ **Death by loneliness:**
A living cell with **fewer than 2 neighbors** dies.
3. ✗ **Death by overcrowding:**
A living cell with **more than 3 neighbors** dies.
4. ♀ **Birth:**
A dead cell with **exactly 3 living neighbors** becomes alive.

✓ 1. Why for agent-based modeling no special training is required?

Asaan Jawab:

Agent-based modeling (ABM) is easy to understand because it **follows real-life logic**. Every agent (like a person, animal, or car) just follows **simple rules**.

Example: If you tell a sheep to eat grass and a wolf to chase sheep, that's basic logic. No advanced math is needed.

★ **Key Point:** ABM is based on "**if this happens, do that**" — so no deep training is needed.

✓ 2. Explain Chaos Theory

Asaan Jawab:

Chaos theory means **small changes can create big effects** in a system.

★ **Example:** Butterfly flaps its wings in Brazil → causes a tornado in Texas.
This is called the **Butterfly Effect**.

It shows how some systems look random but are actually **rule-based** and **sensitive to initial values**.

✓ 3. Explain Common Random Numbers (CRN)

Asaan Jawab:

Common Random Numbers is a **technique** used in simulation to **compare two systems fairly**.

★ **Example:** If you're comparing two queuing systems in a bank, you should give **same random customers** to both. This helps to see which system is actually better — not just lucky.

This reduces **variability** and makes results more **reliable**.

✓ 4. How does the BehaviorSpace tool in NetLogo help with agent-based modeling experiments?

Asaan Jawab:

BehaviorSpace in NetLogo helps you **run many experiments automatically** with different values/settings.

★ Instead of changing variables manually, it:

- Runs simulations **multiple times**
- Collects results **automatically**
- Helps analyze patterns, trends, etc.

So it **saves time** and gives **better analysis**.

✓ 5. When is simulation an appropriate tool and when not?

✓ Simulation is appropriate when:

- The real system is **dangerous** or **expensive** to test (e.g., nuclear plant).
- You want to **predict or understand** system behavior.
- You need to experiment **without affecting** the real world.

✗ Simulation is NOT appropriate when:

- Real system is **simple and easy** to test.
 - You have **exact formulas** or solutions.
 - You don't have **enough data** to build a good model.
-

✓ 6. Explain Complex Adaptive Systems (CAS) and their properties

Asaan Jawab:

A Complex Adaptive System is a system with **many interacting parts (agents)** that can **learn or adapt**.

★ **Examples:** Traffic, stock markets, ant colonies.

◆ **Properties:**

- **Adaptation:** Learns and changes behavior
 - **Emergence:** Simple rules → Complex behavior
 - **Non-linearity:** Small input → Big effect
 - **Feedback:** Output affects future input
 - **Self-organization:** No central control
-

✓ 7. Explain Imperfect Debugging Modeling

Asaan Jawab:

Imperfect debugging happens when **you fix one issue**, but it **creates other issues**.

★ **Example:** You fix a bug in your simulation, but now the system behaves weirdly elsewhere.

It means debugging can sometimes cause **unexpected problems**, so we must test everything again.

✓ 8. Examples of distributions which were created on a physical basis

Asaan Jawab:

Some distributions come from **real-world physical observations**.

◆ Examples:

- **Normal Distribution:** Height, weight, measurement errors
- **Poisson Distribution:** Number of calls in a call center
- **Exponential Distribution:** Time between customer arrivals

These were made by studying **real physical systems**.

✓ 9. Explain Performance Evaluation of a Model

Asaan Jawab:

After building a simulation model, we check:

1. Is the model giving **accurate results**?
2. Does it **run efficiently**?
3. Can we **trust its predictions**?

✦ We evaluate by:

- Comparing with real data
- Running multiple experiments
- Checking speed, accuracy, and stability

This ensures that the model is **reliable for decision-making**.