CS 4632 Midterm Study Guide

CCSE - CS Department

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Introduction

This study guide covers key concepts and example questions derived from lecture materials. While it references content from Modules 1-4, its structure is organized by topic rather than module number for better clarity.

System Modeling and Behavior

Introduction to Models

- Definition and purpose of system models. - Abstraction and simplifications in system modeling. - Real-world examples and applications.

Example Questions:

1. Which of the following best describes a system model?

   - A physical object with no interaction
   - An isolated entity with no behavior
   - A representation of a real-world system

   Correct Answer: A representation of a real-world system

2. What are the key elements of a system model?

   - Components, interactions, and behavior
   - Only physical structure
   - None of the above

   Correct Answer: Components, interactions, and behavior

3. True or False: A system model must always represent every aspect of a real-world system. **Answer: False**

4. Multiple Choice: What are the key elements of a system model?

   - Components, interactions, and behavior

- Only physical structure
- None of the above

Correct Answer: Components, interactions, and behavior

Object-Oriented Discrete Event Models

- Concepts of discrete event-driven simulation. - Object-oriented principles in simulation models. - Examples of single and multi-server models.

Example Questions:

1. What distinguishes an active component in a system?

   - It interacts and changes state
   - It remains static without interaction

   Correct Answer: It interacts and changes state

2. What is the main advantage of event-driven simulation?

   - More efficient than time-step simulation for sparse events
   - Less accurate than time-driven approaches

   Correct Answer: More efficient than time-step simulation for sparse events

3. True or False: Discrete event models update at fixed time intervals. **Answer: False**

4. Multiple Choice: What is the main advantage of event-driven simulation?

   - More efficient than time-step simulation for sparse events
   - Less accurate than time-driven approaches

   Correct Answer: More efficient than time-step simulation for sparse events

Simulation and System Components

Single and Multi-Server Queuing Models

- Understanding single vs multi-server models. - Role of priorities in queuing systems. - Application examples and analysis.

Example Questions:

1. What is the role of an event queue in simulation?

   - Maintains a chronological list of future events
   - Randomly selects events to execute

   Correct Answer: Maintains a chronological list of future events

2. Passive components in a model:

   - Influence system behavior actively
   - Provide structural support but do not change behavior

   Correct Answer: Provide structural support but do not change behavior

3. True or False: In a multi-server queuing model, all servers must have identical processing speeds. **Answer: False**

4. Multiple Choice: What is the role of an event queue in simulation?

   - Maintains a chronological list of future events
   - Randomly selects events to execute

   Correct Answer: Maintains a chronological list of future events

DEVS (Discrete Event Systems)

- Key concepts of DEVS modeling. - Applications and benefits of DEVS. - Differences from other modeling approaches.

Statistical Analysis in Simulation

Data Collection and Verification

- Importance of collecting accurate data. - Using statistical tools for validation. - Model verification techniques.

Example Questions:

1. What is the purpose of sensitivity analysis in simulation?

   - To evaluate how small changes affect the output
   - To ignore minor fluctuations in the data

   Correct Answer: To evaluate how small changes affect the output

2. Which statistical test is commonly used to validate a simulation model?

   - Chi-square test
   - Regression analysis

   Correct Answer: Chi-square test

3. True or False: Sensitivity analysis is used to eliminate variability in simulation results. **Answer: False**

4. Multiple Choice: Which statistical test is commonly used to validate a simulation model?

- Chi-square test
- Regression analysis

Correct Answer: Chi-square test

Conclusion

This expanded study guide provides a structured review of key topics for the midterm, organized by subject rather than module numbers. Be sure to review lecture slides, notes, and additional readings for deeper understanding. Good luck!