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... Bastion of Knowledge...

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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2021 /2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE) MAIN EXAMINATION

COURSE CODE: COM 426

COURSE TITLE: SIMULATION AND MODELING

DATE: 31ST MAY, 2022 TIME: 0900 – 1200 HRS

INSTRUCTION TO CANDIDATES

a. SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES

PLEASE TURN OVER

REGULAR EXAM

COM 426: SIMULATION AND MODELING

STREAM: COM

DURATION: 3 Hours

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

SECTION A [24 MARKS] ANSWER ALL QUESTIONS.

QUESTION ONE [12 MARKS]

- a. Explain why differential equations are important when studying continuous systems simulation **[2 marks]**
- b. Outline the three main roles of graphical models in system modeling. **[3 marks]**
- c. **Explain** any TWO real world problems in business where simulation is applied and their solution methods. **[4 marks]**
- d. What are the main reasons of analyzing a system during system modeling? **[3 marks]**

QUESTION TWO [12 MARKS]

- a. What is system model? Discuss different system perspectives that can be represented in a model. **[4 marks]**
- b. Explain the meaning of Monte Carlo simulation pointing out its key characteristics, advantage and disadvantages. **[4 marks]**
- c. Explain model building, verification and model Validation as distinct processes. **[4 marks]**

SECTION B [36 MARKS] ANSWER ANY THREE QUESTIONS]

QUESTION THREE [12 MARKS]

- a. System is not a randomly arranged set. Explain. **[2 marks]**
- b. Explain why probability theory of interest to performance modeling of information systems? **[2 marks]**
- c. Discuss any two Important features (or concepts) of a business system. **[4 marks]**
- d. Discuss various classification of mathematical models **[4 marks]**

QUESTION FOUR [12 MARKS]

- a. Explain the meaning of a continuous system simulation and model. [2 marks]
- b. Explain any TWO situations that you will prefer simulation and TWO situations in which you will not prefer simulation as an appropriate tool. [4 marks]
- c. Explain how simulation and modeling is applied in the following areas. [6 marks]
 - i. Manufacturing
 - ii. Business process
 - iii. Healthcare

QUESTION FIVE [12 MARKS]

- a. Naylor and Finger proposed THREE step approach for validation process of a simulated model. Discuss these steps. [6 marks]
- b. Explain briefly how the following methods are used to analyze simulation results.
 - i. Estimation Methods [2 marks]
 - ii. Simulation Run Statistics [2 marks]
 - iii. Elimination of Initial Bias [2 marks]

QUESTION SIX [12 MARKS]

- a. What is a queuing system? What is the need of studying queuing systems? [3 marks]
- b. How can system performance in network system be measured? [2 marks]
- c. What are the various type of queuing systems and how are the types arrived at? [4 marks]
- d. Explain A / B / c / D / N / K Kendall's notation is used for parallel server systems [3 marks]

QUESTION SEVEN [12 MARKS]

- c. Explain how you can use the following software in simulation process.
 - i. Simulation in GPSS [2 marks]
 - ii. SSF Model [2 marks]
- e. The average response time for http requests at a web server is 2 minutes. The system busy time was measured to be 50 seconds during a one minute observation interval. Use an M/M/1 model for the system to determine the following.
 - i. What is the average service time per transaction [2 marks]
 - ii. What is the probability there are more than one http request in the system. [2 marks]

iii. On average, how many requests are in the system

[2 marks]

iv. What is the average time a request spends in the queue?

[2 marks]
