(Knowledge for development)

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UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATION
THIRD YEAR SECOND SEMESTER
EXAMINATION

FOR THE DEGREE OF IN
(COMPUTER SCIENCE)

COURSE CODE: CSC 366E

COURSE TITLE: SIMULATION AND MODELING

DATE: 8/9/2022   **TIME:** 2.00 P.M – 4.00 P.M

INSTRUCTIONS TO CANDIDATES:
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

a. What is system model? Discuss different system perspectives that can be represented in a model. **[5 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]**

e. Explain why differential equations are important when studying continuous systems simulation **[2 marks]**

f. Explain the meaning of Monte Carlo simulation pointing out its key characteristics, advantage and disadvantages. **[4 marks]**

g. Explain model building, verification and model Validation as distinct processes. **[5 marks]**

h. What is the meaning of network of queues and how system performance in network system can be measured? **[4 marks]**

QUESTION TWO [20 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 mark]**

c. Discuss any three Important features (or concepts) of a business system. **[6 marks]**

d. Discuss various classification of mathematical models **[4 marks]**

e. Discuss the **ANY THREE** principles used in modelling process. In each case provide a real life justification. **[6 marks]**.

QUESTION THREE [20 MARKS]

a. Explain the meaning of a continuous system simulation and model. **[2 marks]**

b. Explain THREE situations that you will prefer simulation and THREE situations in which you will not prefer simulation as an appropriate tool. **[6 marks]**

c. Explain how simulation and modeling is applied in the following areas. **[6 marks]**

   i. Manufacturing

ii. Business process

iii. Healthcare

d. Discuss various steps followed during a simulation study?   [6 marks]

QUESTION FOUR [20 MARKS]

a. State the key features of Markov Chain and its application areas   [4 marks]

b. Naylor and Finger proposed THREE step approach for validation process of a simulated model. Discuss these steps.   [6 marks]

c. 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]

d. Explain how you can use the following software in simulation process.

   i. Simulation in GPSS   [2 marks]

   ii. SSF Model   [2 marks]

QUESTION FIVE [20 MARKS]

a. What is a queuing system? What is the need of studying queuing systems?   [3 marks]

b. What are the various type of queuing systems and how are the types arrived at? [4 marks]

c. Explain A / B / c / D / N / K Kendall's notation is used for parallel server systems [3 marks]

d. 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   [4 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]