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## NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - JUNE 2023

Subject: Simulation Modelling and Analysis

Time: 3 Hours

Max. Marks: 70

**General Instructions:****IMP:** Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C.** It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

**SECTION A****15****1. Attempt all parts:-**

1-a. Which combination of ingredients is true for computer simulation? (CO1) 1

- (a) Simulation + human
- (b) Simulation + computer
- (c) Simulation + process
- (d) Simulation + model

1-b. Normal Distribution is applied for \_\_\_\_\_ (CO2) 1

- (a) Continuous Random Distribution
- (b) Discrete Random Variable
- (c) Irregular Random Variable
- (d) Uncertain Random Variable

1-c. The reasons which are basically responsible for the formation of a queue should be that (CO3) 1

- (a) The average service rate is less than the average arrival rate
- (b) Output rate is linearly proportional to input

- (c) Output rate is constant and the input varies in a random manner
- (d) All of the above
- 1-d. Which one is not a simulation software (CO4) 1
- (a) Abaqus
- (b) Autocad
- (c) Ansys
- (d) Fusion 360
- 1-e. The output of cat=['cat' 'dog'] is (CO5) 1
- (a) catdog
- (b) cat dog
- (c) cat&dog
- (d) Cat\$Dog

**2. Attempt all parts:-**

- 2.a. List the entities, attributes, activities, event, and state variables of Cafeteria. (CO1) 2
- 2.b. What is utility time? Explain with suitable examples. (CO2) 2
- 2.c. What are the features of a good random number generator? (CO3) 2
- 2.d. What is the use of scatter diagram? (CO4) 2
- 2.e. Create a variable "myage" and store your age in it. Subtract one from the value of the variable. Add two to the value of the variable. (CO5) 2

**SECTION B**

**20**

**3. Answer any five of the following:-**

- 3-a. What are the components of a simple model system? (CO1) 4
- 3-b. Explain the application of Weibull distribution. (CO1) 4
- 3-c. Consider an M/M/1 queueing system. Customer interarrival times have an average of 5 minutes, and service times have an average of 4 minutes. What will be the average number of customers waiting in line? (CO2) 4
- 3-d. Explain a queueing model with constant arrival rate and constant service rate. (CO2) 4
- 3.e. Explain the combined linear congruential random number generation method? (CO3) 4
- 3.f. What is the purpose of model verification? What are the model verification methods? Explain in brief. (CO4) 4

- 3.g. Write a function `nexthour` that will receives one integer argument, which is an hour of the day, and returns the next hour. This assumes a 12-hour clock, so for example the next hour after 12 would be 1. (CO5) 4

## SECTION C

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### 4. Answer any one of the following:-

- 4-a. What are the benefits and pitfalls in modelling and simulation? Explain in brief. (CO1) 7
- 4-b. What are the different types of simulation? Explain its applications in manufacturing. (CO1) 7

### 5. Answer any one of the following:-

- 5-a. In an M/M/1 queueing model, suppose that customers arrive at a Poisson rate of 1 customer per 12 minutes and are serviced at the Poisson rate of 1 service every 8 minutes. Assume that the arrival rate is increased by 20%. In the steady state, what is the increase in average time spent by the customer in the system? (CO2) 7
- 5-b. A xerox machine in an office is operated by a person who does other jobs also. The average service time for a job is 6 minutes per customer. On an average, every 12 minutes, one customer arrives for xeroxing. Find 7
- (i) the xerox machine utilization,
  - (ii) percentage of time that an arrival has not to wait,
  - (iii) average time spent by a customer,
  - (iv) average queue length,
  - (v) the arrival rate if the management is willing to deploy the person exclusively for xeroxing when the average time spent by a customer exceeds 15 minutes. (CO2)

### 6. Answer any one of the following:-

- 6-a. What is the role of chi-square test in the process of random number generation? Explain with an example the chi-square test for random numbers. (CO3) 7
- 6-b. Explain the algorithm of random variate generation with exponential distribution. (CO3) 7

### 7. Answer any one of the following:-

- 7-a. What are the main techniques for verification of simulation computer programs? Explain any three techniques in brief with suitable examples. (CO4) 7
- 7-b. What is estimator and parameter? What are the different types of estimation of parameters for data distribution? (CO4) 7

**8. Answer any one of the following:-**

- 8-a. How to solve a problem of composite heat transfer in abacus? Explain the process in brief. (CO5) 7
- 8-b. Using Simulink, How do you solve the pendulum problem? Explain in brief with suitable example. (CO5) 7

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