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Printed Page:-3 **Subject Code:- AMTME0101**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
M.Tech
SEM: I - THEORY EXAMINATION (2025 - 2026)
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. Simulation should be thought as a technique for (CO1, K1) 1

(a) increasing one's understanding of a problem.
(b) obtaining a relatively inexpensive solution to a problem.
(c) obtaining an optimal solution to a problem.
(d) providing quick and dirty answers to complex problems.

1-b. If we are going to simulate an inventory problem, we must (CO2, K1) 1

(a) run the simulation for many days.
(b) run the simulation for many days many times, i.e., using multiple sets of random numbers.
(c) run the simulation many times, i.e., using multiple sets of random numbers.
(d) run the simulation once, for a relative short period of time.

1-c. The reasons which are basically responsible for the formation of a queue should be that (CO3, K2) 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. Hypermesh is used for (CO4, K1) 1

(a) Meshing
(b) Simulation
(c) Drafting
(d) None of These

1-e. The 'clc' command is used for (CO5, K1) 1

(a) clear the command window
(b) erase everything in the mfile
(c) clean the desktop
(d) save the existing mfile

2. Attempt all parts:-

2.a. When do we use simulation models? (CO1, K2) 2

2.b. With a suitable flow chart describe two server queue system. (CO2, K2) 2

2.c. Why is uniformity required in random numbers? (CO3, K2) 2

2.d. What is the use of scatter diagram? (CO4, K2) 2

2.e. Explain what is Interpolation and Extrapolation in MATLAB? (CO5, K2) 2

SECTION-B 20

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) List the application areas/Industry domains of simulation. (CO1, K2) 4

3.a.(ii) Explain the concept of Discrete-Event Simulation. (CO1, K2) 4

3.b. Answer any one of the following:-

3.b.(i) If an M/D/1 queue has utilization of 80% do you expect its mean queue length and response time to be less, same, or greater than of an M/M/1? Explain your answer. (CO2, K2) 4

3.b.(ii) Explain a general discipline rule for queuing theory. (CO2, K2) 4

3.c. Answer any one of the following:-

3.c.(i) Explain the linear congruential method for random number generation. (CO3, K3) 4

3.c.(ii) For 32-bit computers, write the algorithm to generate the random numbers combining k = 2 generators with m_1 = 2,147,483,563, a_1 = 40,014, m_2 = 2,147,483,399 and a_2 = 40,692. (CO3, K3) 4

3.d. Answer any one of the following:-

3.d.(i) State the four steps involved in the development of an input model? (CO4, K2) 4

3.d.(ii) What is the purpose of model verification? What are the model verification methods? Explain in brief. (CO4, K3) 4

3.e. Answer any one of the following:-

3.e.(i) Write a MATLAB script that prompts the user to enter a numerical grade (0-100). The program should then display the corresponding letter grade based on the following scale: 4

- **90-100:** A
- **80-89:** B
- **70-79:** C
- **60-69:** D
- **Below 60:** F

(CO5, K3)

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3.e.(ii)	Explain the pre-processing and post processing required in simulation. (CO5, K2)	4

SECTION-C 35

4. Answer any one of the following:-

4-a.	Discuss time advance algorithm in event scheduling. (CO1, K3)	7
4-b.	What are the different types of simulation? Explain its applications in manufacturing. (CO1, K2)	7

5. Answer any one of the following:-

5-a.	let W_1be the mean time spent in an M/M/1 system having arrival rate λ and service rate 2μ, whereas W_2 be the mean time spent in an M/M/2 system with arrival rate λ and service rate μ. Assume that $\lambda = \mu = 1$. Then what is the relation in W_1 and W_2? (CO2, K3)	7
5-b.	L'Ecuyer [1988] provides a generator that combines three multiplicative generators, with a1 = 157, m1 = 32,363, a2 = 146, m2 = 31,727, a3 = 142, and m3 = 31,657. The period of this generator is approximately 8x10^12. Generate 5 random numbers with the combined generator, using the initial seeds X1,0 = 100, X2,0= 300 and X3,0 = 500, for the individual generators. (CO2, K3)	7

6. Answer any one of the following:-

6-a.	Explain auto correlation test for random numbers. (CO3, K3)	7
6-b.	The newsstand buys the papers for 33 cents each and sells them for 50 cents each. Newspapers not sold at the end of the day are sold as scrap for 5 cents each. Newspapers can be purchased in bundles of 10. Thus, the newsstand can buy 50, 60, and so on. There are three type of news-days: "good"; "fair"; and "poor"; they have the probabilities 0.35, 0.45, and 0.20, respectively. The distribution of newspapers demanded on each of these days is given, in table. Compute the optimal number of papers the newsstand should purchase. Accomplish this by simulating demands for 20 days and recording profits from sales each day. Demand probability distribution: (CO3, K3) Demand Good Fair Poor 40 0.03 0.10 0.44 50 0.05 0.18 0.22 60 0.15 0.40 0.16 70 0.20 0.20 0.12 80 0.35 0.08 0.06 90 0.15 0.04 0.00 100 0.07 0.00 0.00	7

7. Answer any one of the following:-

7-a.	What is model reasonableness & explain how current contents and total count can verify it? (CO4, K2)	7
7-b.	Briefly explain the validation of input-output transformations of the model and the various techniques used? (CO4, K2)	7

8. Answer any one of the following:-

8-a.	How meshing is done in abacus? What are the different options available for meshing? (CO5, K2)	7
8-b.	What are the various modules available in MATLAB. Explain any four in brief. (CO5, K2)	7