



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

**Programme – B.Tech.(CSE)-DS-2021/B.Tech.(CSE)-DS-2022/B.Tech.(CSE)-DS-2023/B.Tech.
(CSE)-2023**

Course Name – Data Modeling and Simulation

Course Code - PEC-CSD602B/PEC-CSG602B

(Semester VI)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Predict the algorithm which is commonly used for generating random numbers with a normal distribution.
 - a) Box-Muller transform
 - b) Inverse transform method
 - c) Poisson distribution
 - d) Exponential distribution
- (ii) Choose the correct option for the significance of the term "seed" in the context of random number generation.
 - a) It refers to the starting value of a deterministic sequence of random numbers.
 - b) It represents the average value of a random distribution.
 - c) It is used to define the upper limit of a uniform distribution.
 - d) It indicates the mean value of a normal distribution.
- (iii) Write which of the following is NOT a subfield of artificial intelligence (AI)?
 - a) Machine learning
 - b) Natural language processing
 - c) Data visualization
 - d) Computer vision
- (iv) Write what is the primary purpose of computer vision in artificial intelligence?
 - a) Processing and understanding visual information
 - b) Generating text-based reports from images
 - c) Analyzing audio recordings
 - d) Simulating human emotions
- (v) Identify which tool or library is commonly used for developing deep learning. Which tool or library is commonly used for developing deep learning models?
 - a) TensorFlow
 - b) PyTorch
 - c) Keras
 - d) All of the these
- (vi) Select what is probability?
 - a) The study of collecting, organizing, analyzing, and interpreting data
 - b) The measure of the likelihood that an event will occur
 - c) The study of uncertainty and randomness in decision-making
 - d) The process of finding patterns and relationships in data
- (vii) Choose what is the probability of rolling a sum of 7 with two fair six-sided dice?

- a) 1/6
 - b) 1/12
 - c) 1/9
 - d) 1/36
- (viii) Choose in a normal distribution, what percentage of data falls within one standard deviation of the mean?
- a) 0.25
 - b) 0.5
 - c) 0.68
 - d) 0.95
- (ix) Write which of the following is NOT a characteristic of a normal distribution?
- a) Symmetrical bell-shaped curve
 - b) Mean, median, and mode are equal
 - c) Skewed shape
 - d) Approximately 68% of data within one standard deviation of the mean
- (x) Identify what is the formula for calculating the standard deviation of a sample?
- a) $\sqrt{\sum(x - \mu)^2 / n}$
 - b) $\sqrt{\sum(x - \mu)^2 / (n - 1)}$
 - c) $\sqrt{\sum(x - \mu) / n}$
 - d) $\sqrt{\sum(x - \mu) / (n - 1)}$
- (xi) Write which probability distribution is used to model the time until an event occurs given a constant rate of occurrence?
- a) Normal distribution
 - b) Poisson distribution
 - c) Binomial distribution
 - d) Exponential distribution
- (xii) Identify what is the primary objective of hypothesis testing in statistics?
- a) To describe data patterns
 - b) To make predictions about future outcomes
 - c) To make inferences about population parameters based on sample data
 - d) To summarize data using measures of central tendency
- (xiii) Select which of the following statements best describes a Type I error in hypothesis testing?
- a) Rejecting a true null hypothesis
 - b) Failing to reject a false null hypothesis
 - c) Rejecting a false null hypothesis
 - d) Failing to reject a true null hypothesis
- (xiv) Select when conducting a hypothesis test, what is the role of the null hypothesis?
- a) To provide evidence in support of the research hypothesis
 - b) To establish the significance level for the test
 - c) To specify the population parameter to be tested
 - d) To serve as a reference point for comparison with the sample data
- (xv) Identify what does homogeneity of data sets refer to?
- a) The equality of variance between two data sets
 - b) The similarity of means between two data sets
 - c) The presence of outliers in a data set
 - d) The distribution of data points within a data set

Group-B

(Short Answer Type Questions)

 $3 \times 5 = 15$

2. A call center has $\lambda = 18/\text{hour}$ and $\mu = 20/\text{hour}$. Find utilization and comment whether congestion is likely. (3)
3. Case: A student says "state shows condition, event causes change". Justify this statement. (3)
4. A restaurant simulation stores the next arrival time in a data structure. Where is this stored and why? (3)
5. In a computer server, average time spent in the system is 12 minutes, and arrival rate is 3 jobs/minute. Find the average number of jobs in the system. (3)
6. A queue system has arrivals, departures, and queue length. Identify events and state. (3)

OR

A simulation always processes the earliest scheduled event first. Why is this important for correctness? (3)

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Group-C

(Long Answer Type Questions)

 $5 \times 6 = 30$

7. The following table gives the monthly income of 50 employees in a factory. The total monthly income of 7 employees in the class Rs. 400 and above is Rs. 8000. Find the mean. (5)

	220 -	250 -	280 -	310 -	340 -	370 -	400 &
Income (Rs.)	249	279	309	339	369	399	above
No. of Employees	5	9	11	6	7	5	7

8. In 2000 there will be three candidates for the position of Principal – Mr. X, Mr. Y, and Mr. Z – whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that Mr. X, if selected, will introduce co-education in the college is 0.3. The probability of Mr. Y and Mr. Z doing the same are respectively 0.5 and 0.8. What is the probability that there will be co-education in the college in 1984? (5)
9. Explain the process of contribution of ensemble modeling to the credibility of predictive models. (5)
10. A large multi-specialty hospital is experiencing long waiting times in its Outpatient Department (OPD). The management wants to use Simulation to improve patient flow and resource utilization. Explain how Discrete Event Simulation (DES) can be applied to this problem. Describe the system components, modeling approach, performance measures, and how decisions can be supported. (5)
11. Discuss Data modeling with proper example. Describe the steps of data modeling in detail. (5)
12. Evaluate the event scheduling approach in discrete-event simulation. (5)

OR

Critically examine the time advance mechanisms used in discrete-event simulation. (5)

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