17574

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(CSE)-2023/B.Tech.(CSE)-2024/B.Tech.(CSE)-DS-2024
Course Name – Probability & Statistics/Probability and Statistics
Course Code - BSCG301/BBS00014
(Semester III)

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) Enumerate the value of correlation coefficient between X and Y:

X	-2	-1	0	1	2
Y	4	1	0	1	4

a) 0
b) 1
c) -1
d) None of these

(ii) If all the values of a variable are equal to c, then identify the value of standard deviation

a) c
b) 0
c) 2c
d) None of these.

(iii) Identify which of the following formula is used to find dispersion when we have an open-end classes for grouped data.

a) Range
b) Standard deviation
c) Mean deviation
d) Quartile deviation

(iv) Choose the correct option. Bag contain 10 back and 20 white balls, One ball is drawn at random. calcuate the probability that ball is white

a) 1
b) 1/3
c) 2/3
d) 0

(v) Choose the correct option. From a pack of 52 cards, one card is drawn at random. Calculate the probability of a face card drawn

a) 3/13
b) 1/13
c) 1/52
d) 1/26

(vi) An urn A contains 2 white and 3 black chips, and another urn B contains 3 white and 4 black chips. One urn is selected at random, and a chip is drawn from it. If the chip drawn is found black, Calculate the probability that the urn chosen was A

a) 20/41
b) 21/41
c) 19/41
d) None of these.

(vii) Identify the variance of Geometric Distribution is

a) q/p^2
b) q^2/p
c) $p(1-p)/q^2$
d) $q(1-q)/p^2$

(viii) Identify out of the following that is not a property of a binomial experiment.

a) The experiment consists of a sequence of n identical trials
b) Each outcome can be referred to as a success or a failure
c) The probabilities of the two outcomes can change from one trial to the next
d) the trials are independent

(ix) Let X follows Normal distribution with mean 45 and standard deviation 5 and $\phi(1)=0.84$,then estimate $P(X\leq 40)$

a) 0.16
b) 0.84
c) 0.68
d) None of these.

(x) Select the correct option unbiased estimator for population variance σ^2 is

a) $\frac{1}{n}\Sigma(xi - \overline{x})2$
b) $\frac{1}{n-1}\Sigma(xi - \overline{x})2$
c) $\frac{n}{n-1}\Sigma(xi - \overline{x})2$
d) None of these

(xi) If X and Y are random variables with expectations 3 and 5 respectively, then Estimate the expectation of (3X-5Y+16)

a) 16
b) -16
c) 1
d) 0

(xii) Let $E(T1)=\theta$ where θ being an unknown parameter. if $Var(T1)\leq Var(T2)$ for T2 to be any other unbiased estimator, then select the correct option.

a) T1 is minimum variance unbiased estimator.
b) T1 is BLUE
c) T1 is a consistent unbiased estimator.
d) T1 is consistent best linear unbiased estimator

(xiii) In a study, subjects are randomly assigned to one of three groups: control, experimental A, or experimental B. After treatment, the mean scores for the three groups are compared. Identify the appropriate statistical test for comparing these means.

a) Correlation Coefficient
b) T-test
c) F-test
d) ANOVA

(xiv) Select the correct statement for Type II Error.

a) The error of accepting H_0 when H_0 is true
b) The error of rejecting H_0 when H_0 is false
c) The error of accepting H_0 when H_0 is false
d) The error of rejecting H_0 when H_0 is true

(xv) Select the correct measurement from the following ANOVA components that are not additive.

a) Sum of square
b) Mean sum of square
c) Degrees of freedom
d) None of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Discuss probability density function(PDF) and it's properties. (3)

3. Out of two lines of regression given by x 2y-5=0 and 2x 3y-8=0, Identify the regression line of x on y also use the equation to enumerate the means of x and y. (3)

4. Examine that the standard deviation from the following table is 13.56: (3)

x	10	20	30	40	50	60	Total
f	9	18	25	27	14	7	100

5. If $P(A) = 2P(B) = 4/13$ and $P(A|B) = 2/3$, Calculate the value of $P(A \cup B)$. (3)

6. If $x_1, x_2, \ldots x_n$ is a random independent sample observations from Poisson population with parameter θ and $T_1 = \Sigma x_i/n$, Analyze that T_1 is an unbiased estimator of θ. (3)

OR

Distinguish between point estimation and interval estimation. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. For 5 pairs of observations the following results are obtained $\sum X=15$, $\sum Y=25$, $\sum X^2=55$, $\sum Y^2=135$, $\sum XY=83$ Find the equation of the lines of regression and enumerate the value of X on the first line if value of Y=12 and value of Y on the second line if X=8. (5)

8. You toss a fair coin three times: (5)
(i)Calculate the probability of three heads, HHH.
(ii)Calculate the probability that you observe exactly one heads.
(iii)Given that you have observed at least one heads, calculate the probability that you observe at least two heads.

9. Illustrate the mean and variance of Uniform distribution. (5)

10. Explain the method of maximum likelihood and its properties. (5)

11. A student answers a multiple-choice question with 4 alternatives, of which only one is correct. The student either knows the answer or guesses. If the student knows the answer, the probability of answering correctly is 1. If the student guesses, the probability of a correct answer is 0.25. If the probability that the student knows the answer is 0.7, then estimate the probability that the student actually knew the answer, given that they answered the question correctly. (5)

12. Suppose you start up a company that has developed a drug that is supposed to increase IQ. You know that the standard deviation of IQ in the general population is 15. You test your drug on 36 patients and obtain a mean IQ of 97.65. Using an alpha value of 0.05, evaluate if this IQ significantly different than the population mean of 100. (5)

OR

A fertilizer mixing machine is set to give 12 kg of nitrate for every quintal bag of fertilizer. Ten 100 kg bags are examined. The percentage of nitrate are: 14, 11, 13, 12, 13, 12, 13, 11, 13, 12. Evaluate if there is a reason to believe that the machine is defective.Critical value for t-distribution for 9 d.f. is 2.262. (5)

****