

1129

**M. Sc. (Biotechnology) First Semester
MBIO-105: Bio-Statistics**

Time allowed: 3 Hours**Max. Marks: 80**

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting one question from each Unit.

x-x-x

Question(1)

- What factors are responsible for the choice of a chart, diagram and graph?
- What are the major classifications of averages?
- What are the properties of classical probability of an event A?
- Can two events be mutually exclusive and independent simultaneously? Support your answer with an example.
- If a random variable X follows Poisson distribution such that $P(X = 1) = P(X = 2)$, find the mean and variance of the distribution.
- Comment on the following:
For a binomial distribution, mean = 7 and variance = 11.
- Differentiate between critical region and region of acceptance.
- What are the advantages of latin square designs? (8 × 2 = 16)

UNIT I**Question (2):**

- Differentiate between a discrete and continuous variable.
 - Explain different methods of collecting numerical data.
- Explain for what kind of frequency distribution an ogive is drawn. Can you think of any use for an ogive? Explain.
 - Mathematics students completing the final examination for a statistics course received the following scores. report the range, mean, median, variance and standard deviation to these results.
Student: 001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 032
%:85, 79, 98, 84, 72, 84, 70, 90, 78, 85, 77, 86, 90, 84, 75, 96, 77, 83, 87, 78, 60, 88, 87, 82, 97, 76, 69, 86, 80, 92, 85, 80 (8.8)

Question (3):

- What are grouped and ungrouped frequency distributions? What are their uses? What are the considerations that one has to bear in mind while forming a frequency distribution?
- For a group of 200 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on it was discovered that the scores 43 and 35 were misread as 34 and 53 respectively. Find the corrected mean and standard deviation corresponding to the corrected figures. (8.8)

UNIT II**Question (4):**

- If A_1, \dots, A_n are independent events with respective probabilities of occurrence p_1, p_2, \dots, p_n then prove that the probability of occurrence of atleast one

P.T.O.

(2)

of them is given by $P(A_1 \cup A_2 \cup \dots \cup A_n) = 1 - (1 - p_1)(1 - p_2) \dots (1 - p_n)$?

(b) A committee of 3 members is to be formed consisting of one representative each from labour, management, and the public. If there are 3 possible representatives from labour, 2 from management, and 4 from the public, determine how many different committees can be formed using (i) the fundamental principle of counting and (ii) a tree diagram. (8,8)

Question (5):

(a) (b) There are three coins, identical in appearance, one of which is ideal and the other two biased with probabilities $\frac{1}{3}$ and $\frac{2}{3}$ respectively for a head. One coin is taken at random and tossed twice. If a head appears both the times, what is the probability that the ideal coin was chosen. (8,8)

UNIT III**Question (6):**

(a) Define the pdf of Poisson distribution? Where it is used? Obtain the first four moments of Poisson distribution.

(b) In a precision bombing attack there is a 50% chance that a bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give 99% or better chance of completely destroying the target? (8,8)

Question (7):

(a) State and prove Central Limit Theorem.

(b) If X, Y are two random variates with means \bar{X}, \bar{Y} and standard deviations σ_x, σ_y respectively, then prove that

$$(i) \text{Cov}(X, Y) = E(XY) - E(X)E(Y)$$

$$(ii) \text{Var}(X) = E(X^2) - \{E(X)\}^2 \quad (8,8)$$

UNIT IV**Question (8):**

(a) Explain the following terms with reference to testing of hypothesis:

(i) Level of Significance (ii) One-tailed and Two-tailed tests

(iii) Acceptance and Rejection Region (iv) Power of a test.

(b) Give the sampling distribution of the difference of two mean $\bar{x}_1 - \bar{x}_2$ and explain how it is used to test its significance for large samples. (8,8)

Question (9):

(i) Write down the statistical model for a two-factor factorial experiment with a levels of A , b levels of B respectively laid out in completely randomized design. Also give analysis of variance table with expected mean squares.

(ii) Why do you call an experimental design a randomized design. Explain statistical model for completely randomized design with one observation per unit. (8,8)