2022
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. I which is compulsory and selecting one question from each Unit.*

x-x-x

I.   Answer the following:-

i)   Define the variance and also write its formula.

ii) Define random variable with suitable examples.

iii) Write down the assumptions to apply Binomial distribution.

iv) Define factorial-designs.

v)   Write the ANOVA table for Latin Square Design (LSD).

vi) State the central limit theorem.

vii) Differentiate between level of significance and power of the test.

viii) Define expectation of a random variable. (8×2)

Unit-I

2 (a): What do you understand by dispersion? List various measures of dispersion and compare any two of them.

(b): Calculate the median, mode and standard deviation for the following data:

X:	10-20	20-30	30-40	40-50	50-60	60-70
F:	9	11	15	20	13	8

                                                              (6, 10)

3 (a): What do you understand by cumulative frequency curves or Ogive curves and explain how would you locate graphically the median?

(b): Explain the following with examples.
(i)   Experimental probability.
(ii)   Frequency polygon.
(iii)   Subjective Probability.   (7, 9)

Unit-II

4(a): Two dice are tossed. Find the probability of getting 'an even number on the first die or a total of 8'.

(b): In 2010, there will be three candidates for the position of principal-Dr. Ram, Mr. Krishan and Mr. Mohan-whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that Dr. Ram if selected would introduce co-education in the college is 0.3. The probability of Mr. Krishan and Mr. Mohan doing the same are respectively 0.5 and 0.8.

   (i)   What is the chance that there will be co-education in the college in 2011?

   (ii)   If there is co-education in the college in 2011, what is the probability that Dr. Ram is the principal?

(c): Define probability tree and independent events.   (6, 6, 4)

5(a): State and prove multiplication probability theorem for two dependent events.

(b): The probability that a student passes a Physics test is $\dfrac{2}{3}$ and the probability that he passes both a Physics test and an English test is $\dfrac{14}{45}$. The probability that he passes at least one test is $\dfrac{4}{5}$. What is the probability that he passes the English test?

(c): State and prove Baye's theorem.   (6, 4, 6)

Unit-III

6(a): Define Binomial distribution with probability mass function. Also find its mean and variance.

(b): Let X be a random variable with the following probability distribution:

x:	-3	6	9
P(X=x):	1/6	1/2	1/3

Find $E(X)$ and $E(X^2)$ and using the property of expectation, evaluate $E(2X+1)^2$.

(c): Write important properties of Normal distribution.   (6, 6, 4)

7(a): Define the following:
   (i)   Discrete and Continuous random variables with examples.
   (ii)   Poisson and Uniform Distribution.
   (iii) Cumulative Distribution Function (CDF).

(b): Define Bernoulli distribution. Also find its mean, variance and moment generating function (MGF).   (9, 7)

Unit-IV

8(a): Define Randomized Block Design (RBD) and write its advantages and disadvantages.

(b): Develop a test procedure for testing the equality of two means for two normal populations. where population variances are equal and unknown. (8, 8)

9: Define Completely Randomized Design (CRD). Write down its mathematical model and discuss the complete statistical analysis of CRD. Also give the ANOVA table. (16)

x-x-x