

(i) Printed Pages : 4

Roll No. ....

(ii) Questions : 9

Sub. Code : 

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Exam. Code : 

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M.Sc. 1<sup>st</sup> Semester

1125

BIO-TECHNOLOGY

Paper– MBIO–105 : Bio–Statistics

Time Allowed : Three Hours]

[Maximum Marks : 80

**Note:**– Attempt **five** questions in all, with at least **one** question from each unit and question No. I is compulsory. Each question carry equal marks. Graph paper will be available on request.

**(Compulsory Question)**

- I. (a) What would be the values of mean, median and mode if the frequency distribution is symmetrical ?
- (b) What is the difference between discrete and continuous random variable ?
- (c) If  $Y = 2X + 8$ , find the standard deviation of Y.
- (d) Write the probability mass function of Poisson distribution.
- (e) Explain briefly the normal approximation of binomial distribution.
- (f) Explain the purpose of t-test and F-test in biological experiments.
- (g) If  $X \sim U_{[a, b]}$ , What is the  $E(X)$  ?
- (h) Write the ANOVA of two-way classified data with one observation per cell.

## UNIT-I

- II. (a) What are the properties of a good average ? Examine those properties with reference to measures of central tendency.
- (b) A researcher examined the following data on Serum Lipid Peroxide (SLP) levels from a laboratory reports of a sample of 10 adult subjects undergoing treatment for diabetes mellitus:

5.85, 6.17, 6.09, 7.70, 3.17, 3.83, 5.17, 4.31, 3.09, 5.24.

Compute the mean, median and variance.

- III. (a) What is standard deviation ? Explain its superiority over other measures of dispersion.
- (b) What do you understand by Ogive curves and explain how would you locate graphically median and quartiles ?
- (c) Goals scored by two teams A and B in a football season were shown below :

Name of goals scored in a match	Name of Matches	
	Team A	Team B
0	27	17
1	9	9
2	8	6
3	5	5
4	4	3

Find out which team is more consistent ?

## UNIT-II

- IV. (a) The probability that A hits the target is  $\frac{1}{4}$  and the probability that B hits the target is  $\frac{2}{5}$ . Both shoot at the target. Find the probability that at least one of them hit the target.
- (b) If an event A is independent of itself. Show that  $P(A) = 0$  or 1.
- (c) In a certain college, 4% of the men and 1% of women are taller than 6 feet. Furthermore, 60% of the students are women. Suppose a randomly selected student is taller than 6 feet. Find the probability that the student is a woman.
- V. (a) State multiplication theorem and total probability theorem.
- (b) What is probability tree ?
- (c) An electronic experiment consists of two machines  $\alpha$  and  $\beta$ . The following probabilities are assumed to be known :  
 $P(\alpha \text{ fails}) = 0.20$ ,  $P(\beta \text{ fails alone}) = 0.15$  and  $P(\alpha \text{ and } \beta \text{ fails}) = 0.15$ . Find :  
(i)  $P[\alpha \text{ fails} / \beta \text{ has failed}]$   
(ii)  $P(\alpha \text{ fails alone})$ .

## UNIT-III

- VI. (a) Define cumulative distribution function of a continuous random variable and mention its important properties.



- (b) Plot the graph of the CDF of a discrete random variable  $X$  with the following probability distribution :

$x$	$-3$	$2$	$6$
$p(x)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

- VII. (a) Define Bernoulli trials and binomial distribution.  
 (b) Find the expected value and variance of binomial distribution.  
 (c) The probability that a person suffering from migraine headache will obtain relief with a particular drug is 0.9. Three randomly selected sufferers from migraine headache are given the drug. Find the probability that the number obtaining relief will be exactly zero.

### UNIT-IV

- VIII. (a) Explain the terms :

- (i) Types of Errors  
 (ii) Power of the test

- (b) What are the assumptions made in t-test and F-tests of significance ?

- (c) A random sample of 10 boys had the following IQ's :

70, 120, 110, 101, 88, 83, 95, 98, 107, 100

Do these data support the assumption of a population mean IQ of 100 ?

Given Tabulated value of  $t$  at 5% level of significance and 9 degrees of freedom is 2.262 (for two-tail tests).

- IX. (a) Describe the principles of randomization and replication used in biological experiments.  
 (b) Describe the completely randomized design.