Exam. Code : 206601
Subject Code : 3638

M.Sc. Bio-Informatics 1st Semester
BI-513 : BASIC BIOSTATISTICS

Time Allowed—3 Hours]   [Maximum Marks—75

Note :— Attempt **five** questions in all, selecting at least one question from each section. All questions carry equal marks.

SECTION—A

I.   (a)   Prove that for any discrete frequency distribution standard deviation is not less than mean deviation from mean.

     (b)   How many different types of bar-diagrams are possible for representation of data ? Indicate their use.

     (c)   From a group of 200 candidates, the mean and standard deviation 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 correct mean and standard deviation corresponding to correct figures.

         6+4+5

II.   (a)   What is Skewness ? Describe its different measures.

     (b)   Explain briefly the various methods that are used for graphical representation of frequency distribution.

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(c) Calculate the value of the median and mode from the following data :

Age (in years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of Persons	50	70	100	180	150	120	70	60

5+5+5

SECTION—B

III. (a) Define the following terms and explain these with the help of an example :—

(i) Simple space

(ii) Exhaustive events

(iii) Mutually exclusive events

(iv) Equally likely events.

(b) For any two events A and B, Prove that :—

(i) $P(A \cap \overline{B}) \leq P(A \cup B) \leq P(A) + P(B)$

(ii) $P[(A \cap \overline{B}) \cup (\overline{A} \cap B)] = P(A) + P(B) - 2P(A \cap B)$

(c) What is the probability that at least two out of 10 people have the same birthday ? Assuming that there are 365 days in a year. 6+5+4

IV. (a) State and prove Bayes theorem of probability.

(b) The probability of solving a problem in statistics given to two weak students A and B is $\frac{1}{6}$ and $\frac{1}{8}$ respectively. If the probability of their making common error is $\frac{1}{525}$ and they obtain the same answer then find the probability that their answer is correct.

(c) State and prove the law of total probability. 5+6+4

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SECTION—C

V. (a) What do you mean by random variable ? Describe its different main types.

(b) The number of shoots on a branch is a random variable x which has probability mass function :

$f(x) = kx$; for $x = 1, 2, 3,...., 5$.

Find the value of k and probability that the number of shoots are more than 2 but less than 5. Also find the mean and variance of number of shoots.

(c) Define binomial distribution and find its mean and variance.   4+6+5

VI. (a) Show that Poisson distribution is limiting form of binomial distribution under some conditions. Find its mean and variance.

(b) Define Normal distribution. Prove that all odd order central moments of it are zero and even order central moments are related by the relation.

$\mu_{2n} = \sigma^2 (2n - 1)\mu_{2n-2}$; $n = 1, 2, 3,...$ 7+8

SECTION—D

VII. (a) Explain the difference between correlation and regression. Also explain with examples.

(b) Obtain the lines of regression.

(c) Given that $X = 4Y + 5$ and $Y = KX + 4$ are the lines of regression of X on Y and Y on X respectively.

Show that $0 < 4K < 1$. If $K = \dfrac{1}{16}$, find the means of the two variables and coefficient of correlation between them.   4+5+6

VIII.(a) Explain F-test for equality of population variance. Applying suitable test, show that the following samples come from the same normal population :

Sample	Size	Sample mean	Sum of squares of deviations from mean
1	10	15	90
2	12	14	108

[Given $F_{0.05}(9, 11) = 2.90$].

(b) Describe scatter diagram. How is it helpful in judging the type of correlation ?

(c) Define correlation coefficient. What does it measure ? What will you conclude if correlation coefficient between two variables is (i) 1, (ii) 0, (iii) −1 ?

7+4+4