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

Time Allowed—Three Hours]   [Maximum Marks—75

Note :— Candidates are to attempt **FIVE** questions, **ONE** from each Section. **Fifth** question may be attempted from any Section. All questions carry equal marks.

SECTION—A

1. (a) Define frequency, frequency density, cumulative frequency, class limits, class boundaries, primary and secondary data.

   (b) Exhibit the data in the following table by suitable diagram :

   Food production in India : Area and Yield

Year	Total Area (in 1000 hectares)	Total Yield (in 1000 tones)
1965–66	115103	72347
1966–67	115302	74231
1967–68	121421	95952
1968–69	120430	94913
1969–70	123570	99501

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

   (b) What do you mean by quartiles ? Explain the use of it for measuring the dispersion. Why standard deviation is considered as best measures of dispersion ?

SECTION—B

3. (a) Define conditional probability. If A and B are two events with $P(A) = 0.6$, $P(A \cap B) = 0.3$ and $P(B) = 0.5$. Find the values of $P(\overline{A}/\overline{B})$ and $P(A/\overline{B})$.

   (b) State and prove Baye's Theorem.

   (c) Four cards are drawn at random from a pack of 52 cards. Find the probability that two are black and two are red.

4. (a) State and prove addition law of probability.

   (b) A and B are two students of Statistics and their chances of solving a problem in Statistics correctly are $\frac{1}{6}$ and $\frac{1}{8}$ respectively. If the probability of their making a common error is $\frac{1}{525}$ and they obtain the same answer, find the probability that their answer is correct.

2448(2119)/HH-13033   2   (Contd.)

SECTION—C

5. (a) Define cumulative distribution function of a random variable and state its important properties.

   (b) Let X has the probability density function :

   $$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

   Determine cumulative distribution function. Also find $P\left[\dfrac{1}{3} < x < \dfrac{4}{3}\right]$.

6. (a) Define Binomial distribution and find its mean and variance.

   (b) Show that Poisson distribution is the limiting form of binomial distribution under certain conditions. Also show that mean and variance of Poisson distribution are equal.

SECTION—D

7. (a) Define line of regression. Why we have two regression lines for the case of bivariate distribution ? Explain the utility of the regression of y on x.

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(b) 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 two variables and coefficient of correlation between them.

8. (a) Explain t-test for difference of means.

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

Sample	Size	Sample Mean	Sum of Squares of Deviation from Mean
1	10	15	90
2	12	14	108

(Given that $F_{0.05}(9, 11) = 2.90$)

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