B.Sc. Part—I (Semester—I) Examination 1S: BIOINFORMATICS

(Elementary Mathematics and Statistics)

Time—Three Hours]

[Maximum Marks-80

Note: (1) Attempt ALL questions.

- (2) Question No. 1 is compulsory.
- 1. (a) Fill in the blanks:—

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- (i) If a coin is tossed n times, then the Sample Space contains _____ elements.
- (ii) If K is some constant and u is a derivable function of x and y = Ku then $\frac{dy}{dx}$ is equal to _____.
- (iii) The function F(x) is even iff F(-x) =_____.
- (iv) Quartile 2 is also known as ____.
- (b) Choose the correct alternative and rewrite the complete sentence:— 2
 - (i) The order of the differential equation

$$\frac{d^3y}{dx^3} = \sqrt[4]{y + \left(\frac{dy}{dx}\right)^5} \text{ is } \underline{\hspace{1cm}}.$$

(a) Three

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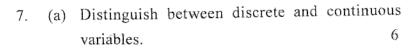
1

(Contd.)

- (b) Four
- (c) Five
- (d) None of these
- (ii) If f(x) and g(x) are continuous function x = a then f(x) + g(x) is continuous at _____.
 - (a) x = a
 - (b) x = -a
 - (c) x = 0
 - (d) None of these
- (iii) If definite integral of a given function is not:
 - (a) Absolute
 - (b) Unique
 - (c) Constant
 - (d) None of these
- (iv) Degree of the DE

$$x^{2}\left(\frac{dy}{dx}\right)^{2} + xy\frac{dy}{dx} - 6y^{2} = 0 \text{ is } \underline{\hspace{1cm}}.$$

- $(a) \quad 0$
- (b) 1



(b) A continuous random variable X has a probability distribution function :

$$f(x) = 3x^2, 0 \le x \le 1.$$

Find a and b such that:

- (i) $P\{x \le a\} = P\{x > a\}$ and
- (ii) $P\{x > b\} = 0.05$

OR

- (p) State and prove multiplicative law of expectation
 for discrete random variable.
- (q) If x and y are random variables then prove that E(x + y) = E(x) + E(y) provided that all the expectations exist.

- 5. (a) Name the different kinds of averages and discuss their merits and demerits.
 - (b) State the different measures of skewness that are commonly used.

OR

- (p) Explain the difference between histogram and frequency polygon.
- (q) In what respect the weighted mean is superior to the simple average?
- 6. (a) Define independent events. If A and B are independent events, then prove that \overline{A} and \overline{B} are also independent events.
 - (b) State and prove law of addition of probabilities.

OR

- (p) If two dice are thrown then what is the probability of the sum is:
 - (a) Greater than 8
 - (b) Neither 7 nor 11.
- (q) For any three events A, B and C prove that $P(A \cup B/C) = P(A/C) + P(B/C) P(A \cap B/C).$

- (c) 2
- (d) None of these
- (c) Answer the following questions in brief: 4
 - (i) Write any two properties of a definite integral.
 - (ii) What is meant by mutually exclusive events?
 - (iii) What are quartiles?
 - (iv) What is linear regression?
- (a) Discuss the continuity of f(x) in the interval (0, 5) if

$$fx = \frac{x^2 - a}{x - 3} \text{ for } x \neq 3$$
$$= 6 \qquad \text{for } x = 3$$

(b) For the probability density function

$$f(x) = \frac{2(b+x)}{b(a+b)}, -b \le x < 0$$

$$=\frac{2(a-x)}{a(a+b)}, \quad 0 \le x \le a$$

find means, median, and variance.

(c) Using (\in, δ) definition, show that

$$\lim_{x \to 1} (5x - 3) = 2. 4$$

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OR

- (p) A wire of length 12 cm is to form a rectangle. Find the dimensions of a rectangle.
- (q) Find $\frac{dy}{dx}$ if $y = \sin^{-1}(\sqrt{1-x^2})$.
- (r) Define continuity of a function at a point. 4
- 3. (a) If $x = \phi$ (f) be a derivable function then prove that

$$\int f(x) dx = \int f \phi(f)'(f) dt.$$

(b) Show that

$$\int_{0}^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx = \frac{\pi}{4}.$$

(c) Evaluate $\int_{0}^{\pi/2} \sin x \, dx$, using the definition of a definite integral as the limit of a sum.

OR

(p) Evaluate

$$\int \frac{dx}{\sqrt[4]{x^2 - a^2}} \,. \tag{4}$$

(q) Find the area bounded by the x-axis, the curve $y = c \cosh (x/c)$ and the ordinates x = 0, x = a.

- (r) Find the volume of a right circular cone of height h with base radius r. 4
- 4. (a) If two regression equation between x and y are 10x 20y 14 = 0, 5x 6y = 47, the standard deviation of x is 9 then find the mean values of x and y.
 - (b) Describe briefly the construction of histogram and frequency polygon of a frequency distribution.

OR

(p) Calculate the mean and standard deviation for the following table giving the age distribution of 542 members:

Age in Years	No. of Members	
2030	3	
30-40	61	
40—50	132	
5060	153	
60—70	140	
70—80	51	
8090	2	6

(q) What are quartiles? How are they used to measure skewness?

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