B.Sc. (Part—I) Semester—I Examination

BIOINFORMATICS

(Elementary Mathematics & Statistics)

Time : Three Hours] [Maximum Marks : 80

N.B. :— (1) Attempt **ALL** compulsory.

(2) Question No. **1** is compulsory.

1. (a) Fill in the blanks :—

(i) If f(x) and g(x) are continuous function at x = a then f(x) + g(x) is continuous at ... ½

(ii) The degree of the differential equation $\frac{d^3y}{dx^3} = 4\sqrt{y+\left(\frac{dy}{dx}\right)^5}$ is ..... ½

(iii) Quartile 2 (Q2) is also called as ..... ½

(iv) If a coin is tossed once, then the sample space contains ..... elements. ½

(b) Choose the correct alternative and rewrite the complete sentence :—

(i) Indefinite integral of a given function is not :

(a) Absolute (b) Unique

(c) Constant (d) None of these ½

(ii) The order of the differential equation :

$\frac{d^2y}{dx^2} + x^2\frac{dy}{dx} - y\sin x = 0$ is

(a) One (b) Two

(c) Zero (d) None of these ½

(iii) Decile divides the data in ..... equal parts :

(a) 10 (b) 4

(c) 2 (d) 99 ½

(iv) If four coins are tossed, then the probability of the occurrence of 2 heads and 2 tails :

(a) 8/3 (b) 2

(c) 3/8 (d) None of these ½

(c) Answer the following questions in one sentence :—

(i) State any four properties of a definite integral. 1

(ii) Classify the differential equation :

$$\left(\frac{d^2y}{dx^2}\right)^2 + 2\left(\frac{dy}{dx}\right)^3 + 3y = x^2 - e^{3x}.$$ 1

(iii) Which symbol is used for standard deviation ? 1

(iv) Define probability. 1

2. (a) Define continuity of a function at a point. 4

(b) Find the absolute maximum and absolute minimum values of the function :

$f(x) = 2x^3 - 21x^2 + 60x + 1, \quad 0 < x < 7$ 4

(c) Explain regression equation. 4

OR

(p) Give the law of addition of Probability. 4

(q) If $\log (x^2 + y^2) = 2 \tan^{-1}\left(\frac{y}{x}\right)$ then show that $\frac{dy}{dx} = \frac{x+y}{x-y}$. 4

(r) What is standard deviation ? 4

3. (a) If $x^p y^q = (x + y)^{p+q}$ then show that $\frac{dy}{dx} = \frac{y}{x}$. 4

(b) What is conditional probability ? 4

(c) Write down the difference between histogram and bar diagram. 4

OR

(p) The limit of the function, if it exists is unique. 4

(q) A wire of length 4 cm is to form a rectangle. Find the dimensions of a rectangle so that it has maximum area. 4

(r) Explain Independent Events. 4

4. (a) Deduce the differential equation from :

$y = Ae^{mx} + Be^{nx} + C$

by eliminating A, B and C. 4

(b) Write down about mean and its merits and demerits. 4

(c) Explain the law of multiplication. 4

OR

(p) If two dice are thrown then what is the probability that the sum is :

(i) Greater than 8

(ii) Neither 7 nor 11 ? 6

(q) Draw the frequency polygon and ogive curve for following data :

Age in years	10—20	20—30	30—40	40—50	50—60	60—70
Person	3	13	22	35	24	15

6

5. (a) Explain Sample Points, Mixed Events, Mutually Exclusive events with example. 6

(b) Calculate the mean and median for following :—

x	1	2	3	4	5	6	7	8
f	3	6	5	7	10	14	11	10

6

OR

(p) Solve the differential equation when y = 2 and x = 1

$$y - x\frac{dy}{dx} = y^2 + \frac{dy}{dx}.$$ 4

(q) Solve the differential equation :

$x^2\,dy + y(x + y)\,dx = 0.$ 4

(r) Solve the differential equation :

$$2\cos x\,\frac{dy}{dx} + 4y\sin x = \sin 2x.$$ 4

6. (a) Discuss Baye's theorem. 4

(b) Evaluate $\int \frac{\sin x}{1+\sin x}\,dx$ 4

(c) Express $\int_0^2 (3x+5)\,dx$ as the limit of a sum and evaluate. 4

OR

(p) Distinguish between discrete and continuous variables. 6

(q) Write down the different averages and their merits and demerits. 6

7. (a) Find the area bounded by the parabola $y = x^2 - 5x + 4$, the x-axis and the line x = 2 and x = 3. 4

(b) Evaluate $\int \frac{1}{x\sqrt{x^2 - a^2}}\,dx$. 4

(c) Show that $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx = \pi/4$. 4

OR

(p) If A and B are any two events then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. 6

(q) What is Correlation ? Explain Scatter diagram with example. 6