

B.Sc. (Part—I) Semester—I Examination
IS : 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 :

- (i) If K is some constant and u is a derivable function of x and $y = KU$ then $\frac{dy}{dx}$ is equal to _____. ½
- (ii) The function f(x) is odd iff $f(-x) = \underline{\hspace{2cm}}$ $x \in X$. ½
- (iii) Skp is represented as _____. ½
- (iv) If a pair of fair dice is tossed then $n(s) = \underline{\hspace{2cm}}$. ½

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

- (i) If f(x) and g(x) are continuous function at $x = a$ then $f(x) + g(x)$ is continuous at _____.
 - (a) $x = -a$
 - (b) $x = a$
 - (c) $x = 0$
 - (d) None of these ½
- (ii) If $y = f(x)$ is a function and $f'(a) = 0$ and f(x) is decreasing at $x > a$ and increasing at $x < a$ then $x = a$ is called as :
 - (a) Minima
 - (b) Maxima
 - (c) Point of inflection
 - (d) Local Maxima ½
- (iii) Quartile divides the data in _____ equal parts.
 - (a) 10
 - (b) 4
 - (c) 99
 - (d) 12 ½
- (iv) If 2 coins are tossed once, then the number of sample points are :
 - (a) 4
 - (b) 8
 - (c) 10
 - (d) 0 ½

(c) Answer the following questions in **one** sentence each :

- (i) Define Decile. 1
- (ii) What do you mean by regression ? 1
- (iii) What is meant by random variable ? 1
- (iv) What are quartiles ? 1

- 2. (a) Prove that $f(x) = x^3$ is continuous at point 3 by using definition of $\epsilon - \delta$ continuity. 4
- (b) If $\cos^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = \tan^{-1} a$ then show that $\frac{dy}{dx} = \frac{y}{x}$, where 'a' is constant. 4
- (c) Explain Median and its Merits and Demerits. 4

OR

- (p) Find the value of x for which the function f is given by $f(x) = 2x^3 - 3x^2 - 12x + 10$ is increasing. 4
 - (q) Explain any two types of functions with examples. 4
 - (r) Write down the difference between frequency polygon and ogive curve. 4
3. (a) Show that $\int_0^{\pi/2} \log \tan x \, dx = 0$. 4
- (b) Express $\int_0^2 e^x \, dx$, using the definition of a definite integral as the limit of a sum. 4
 - (c) What is Quartile Deviation? 4

OR

- (p) Show that $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} \, dx = \frac{\pi}{4}$. 4
 - (q) Evaluate $\int \frac{1}{\sqrt{x^2 - a^2}} \, dx$ 4
 - (r) Find the area of the region lying between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, where $a > 0$. 4
4. (a) Deduce the differential equation from $y = A \cos 3x + B \sin 3x$ by eliminating arbitrary constant A and B. 4
- (b) Solve the differential equation :

$$y - x \frac{dy}{dx} = a \left(y^2 + \frac{dy}{dx} \right) \quad 4$$

- (c) Solve the differential equation :
 $(1 - x^2)(1 - y) \, dx = xy(1 + y) \, dy$. 4

OR

- (p) What are partition values ? Explain different types of partition value. 6
- (q) Explain Box and Whisker diagram and draw for the following data :
x - 10 9 11 13 15 16 19 22. 6

5. (a) Find the maximum and the minimum value of the function $f(x) = 3x^3 - 9x^2 - 27x + 15$. 4
- (b) If $\log(x^2 + y^2) = 2 \tan^{-1}(y/x)$ then show that $\frac{dy}{dx} = \frac{x + y}{x - y}$. 4
- (c) Find the volume of a right circular cone of height h with base radius r . 4

OR

- (p) Calculate the Karl Pearson's coefficient of skewness for the following data :

x	5	15	25	35	45
y	5	8	15	16	6

6

- (q) Three groups of children contain respectively 3 girls and 1 boy; 2 girls and 2 boys; 1 girl and 3 boys. One child is selected at random from each group. Find the probability that the three selected children include 1 girl and 2 boys. 6

6. (a) Calculate the Percentile and Decile that is P_{15}, P_{70}, P_{99} and D_4, D_7, D_9 for the following data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	20	40	70	85	65	50

6

- (b) Two cards are drawn from a well-shuffled pack. Find the probability that :

(i) Both are kings

(ii) One king and one queen

(iii) Both are hearts. 6

OR

- (p) If f and g are integrable functions of x , then prove that :

$$\int_a^b [f(x) + g(x)] dx = \int_a^b f(x) dx + \int_a^b g(x) dx.$$

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- (q) Solve the differential equation :

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

6

7. (a) Explain the terms :

(i) Mutually exclusive events

(ii) Equally likely events

(iii) Sample space. 6

- (b) Explain Probability Mass Function (PMF). 6

OR

(p) Draw the histogram for the following data :

Weekly Wages	No. of Workers
10-15	7
15-20	19
20-25	27
25-30	15
30-35	12
35-40	12
40-45	8
45-50	9

6

(q) If A and B are independent, then prove that A and B' are also independent.

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