(i) **Printed Pages: 3**   Roll No. ....

(ii) **Questions   : 7**   **Sub. Code :** | 0 | 9 | 9 | 2 |
                                  Exam. Code : | 0 | 0 | 3 | 9 |

B.Sc. (Hons.) Bioinformatics 1st Semester

(2122)

MATHEMATICS

Paper : BIN-1005

Time Allowed : Three Hours]   **[Maximum Marks : 60**

Note :—Attempt **five** questions in all, by selecting **two** questions from each Unit and first question is compulsory.

1. (a) Let $A = \{1, 2\}$ and $B = \{3, 4\}$ be two sets. How many relations and how many functions are possible from the set A to the set B ?

   (b) Find range of the function $f(x) = \sqrt{16 - x^2}$.

   (c) Find middle term(s) in the expansion of $(2x + 3y)^5$.

   (d) Find r, if $5 \times {}^4P_r = 6 \times {}^5P_{r-1}$.

   (e) Evaluate $\lim\limits_{x \to 0} \dfrac{\sqrt{x + 1} - 1}{\sin x}$.

   (f) Evaluate $\dfrac{dy}{dx}$ when $y = \dfrac{e^x \log x}{x^2}$. 6×2

UNIT–I

2. (a) What do you mean by an Equivalence Relation ? Give example of an Equivalence Relation on the set of Natural Numbers. 4

 (b) Let A = {1, 2, 3}, B = {3, 4} and C = {4, 5, 6}. Find A × (B ∩ C) and (A × B) ∩ (A × C). 4

 (c) Draw graph of the function $f(x) = 1 + \tan(x - 1)$. Find its domain and range, also find a subset of the domain where $f(x)$ is one-one. 4

3. (a) How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated ? 6

 (b) How many parallelograms will be formed if 7 parallel horizontal lines intersect 6 parallel vertical lines ? 6

4. (a) How many integral terms are there in the expansion of $\left(\sqrt{3} + \sqrt[8]{5}\right)^{256}$? 4

 (b) Find middle term in the expansion of $\left(x + \dfrac{1}{2x}\right)^{2n}$. 4

 (c) Find the coefficient of x^6y^3 in the expansion of $(x + 2y)^9$. 4

UNIT–II

5. (a) If the function $f(x) = \begin{cases} 5x - 4, & \text{if } 0 < x \le 1 \\ 4x^2 + 3bx, & \text{if } 1 < x < 2 \end{cases}$ is continuous at every point of its domain then find value of b. 4

(b) Find $\dfrac{dy}{dx}$ if $x \cdot y = e^{x-y}$.   4

(c) Find derivative of $\sin^{-1}\left(\dfrac{2x}{1-x^2}\right)$ with respect to

$\cos^{-1}\left(\dfrac{1-x^2}{1+x^2}\right)$.   4

6. (a) A balloon, which always remains spherical has a variable radius. Find the rate at which its volume is increasing with the radius when the latter is 10 cm.   6

(b) Find intervals of increasing and decreasing for the following function :

$$f(x) = x^3 - 6x^2 + 9x + 3 \qquad 6$$

7. (a) Evaluate the integral $\displaystyle\int \dfrac{x+1}{x(1+xe^x)^2}\,dx$.   6

(b) Compute area enclosed between the curves $y = \sin^2 x$ and $y = \cos^2 x$ for x lies in the interval $[0, \pi]$.   6