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

(ii) Questions : 7 Sub. Code : 1227

Exam. Code : 0071

B.Sc. (Hons.) 1st Semester

1125

BIO-INFORMATICS

Paper—BIN-1005 : Mathematics

Time Allowed : Three Hours] [Maximum Marks : 60

Note :— Candidates are required to attempt **five** questions in all by selecting at most **two** questions from each of the units I & II.

I. (a) By using Venn Diagrams or otherwise show that $(A \cap B)^c = A^c \cup B^c$. 2

(b) Let $A = \{1, 2, 3\}$ and $B = \{a, b\}$, define a 1-1 function from $A \times B$ to $B \times A$. 2

(c) Compute the number of terms in the expansion of $[(x + a)^2 (x - a)^2]^7$. 2

(d) Which term of the expression $\left(2x + \frac{1}{x^2}\right)^6$ will be independent of x ? Write this term. 2

(e) Evaluate $\lim_{x \to 0} \sin \frac{(3x)^2}{x}$. 2

(f) Find $\frac{dy}{dx}$ in terms of x and y if $x = \sin t^2$ and $y = \cos t^2$. 2

UNIT—I

II. (a) Find domain and range of the function $f(x) = 3 \sin (2x)$, also plot its graph. 6

(b) What do you mean by an equivalence relation ? Give example of :

(i) an equivalence relation,

(ii) a relation which is symmetric, transitive but not reflexive. 6

III. (a) Out of 80 students in a class, 25 are studying German, 15 French and 13 Spanish. 3 are studying German and French; 4 are studying French and Spanish 2 are studying, German and Spanish; and none is studying all the 3 languages. How many students are not studying any of the three languages ? 4

(b) Find value of the expression $C^7_0 + C^7_1 + C^7_2 + C^7_3 + C^7_4 + C^7_5$; here C^7_r represents, the number of ways of selecting r objects out of 7 objects. 4

(c) Find total number of eight digit numbers having all the digits different. 4

IV. (a) Show that $C^n_r + C^n_{r-1} = C^{n+1}_r$, C^n_r is the number of ways of selecting r objects out of n objects. 4

(b) How many words, with or without meaning, each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE ? 4

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

UNIT—II

V. (a) Evaluate $\lim_{x \to 0} \frac{\sin^3 x \cos 2x}{\sin 2x}$ and differentiate $f(x) = \frac{x + \cos x}{\tan x}$ with respect to x. 4

(b) If $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$ is continuous at $x = 1$ then what are possible values of a and b. 4

(c) By using definition of the derivative show that derivative of $f(x) = \frac{1}{x}$ is $f'(x) = -\frac{1}{x^2}$. 4

VI. (a) A balloon, which always remains spherical, has a variable diameter $\frac{3}{2}(2x + 1)$.

Find the rate of change its volume with respect to x. 6

(b) Show that $\int \sec x \, dx = \log | \sec x + \tan x | + C$. 6

VII. (a) Find the area enclosed between the circles $x^2 + y^2 = a^2$ and $4x^2 + 4y^2 = a^2$. 6

(b) Find the area of the region $R = \{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$. 6