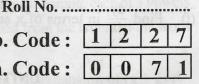
**Printed Pages: 3** (i)

Questions

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(ii)

Sub. Code: Exam. Code:



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. By using Venn Diagrams or otherwise show that (a)  $(A \cap B)^{\circ} = A^{\circ} \cup B^{\circ}.$ 2
  - Let  $A = \{1, 2, 3\}$  and  $B = \{a, b\}$ , define a 1-1 function from (b)  $A \times B$  to  $B \times A$ . 2
  - (c) Compute the number of terms in the expansion of  $[(x + a)^2 (x - a)^2]^7$ . 2
  - Which term of the expression  $\left(2x + \frac{1}{x^2}\right)^6$  will be independent (d) of x? Write this term. 2

1

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

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Turn over

2

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

2

6

# 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.
- 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?
  - (b) Find value of the expression  $C_0^7 + C_1^7 + C_2^7 + C_3^7 + C_4^7 + C_5^7$ ; here  $C_r^7$  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  $C_r^n + C_{r-1}^n = C_r^{n+1}$ ,  $C_r^n$  is the number of ways of selecting r objects out of n objects. 4

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2

- (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

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 
$$f(x) = \begin{cases} a + bx, \ x < 1 \\ 4, \ x = 1 \text{ is continuous at } x = 1 \text{ then what are} \\ b - ax, \ x > 1 \end{cases}$$

possible values of a and b.

- (c) By using definition of the derivative show that derivative of  $f(x) = \frac{1}{x}$  is  $f'(x) = -\frac{1}{x^2}$ .
- 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  $4x^2 + 4y^2 = a^2$ .
  - (b) Find the area of the region  $R = \{(x, y) : 0 \le y \le x^2 + 1, 0 \le y \le x + 1, 0 \le x \le 2\}.$

3