MBC-1603220001010200 Seat No. _____

B. Sc. (Sem. I) (Bio-Informatics) (CBCS) Examination

November / December – 2016

BI - 102 : Mathematics & Statistics

Time : Hours] [Total Marks : **70**

1. (A) Answer the following Questions. [4]

(a) If $A = \{a, b\}$ then find A^2.

(b) Write the Real part of $\frac{1-2i}{5}$

(c) If A and B are any two set then A - B =.....

(d) State the De Morgan's laws in set theory.

(B) Attempt any One. [2]

(a) Given $\bar{z} = 5 + 3i$ then prove that $z\bar{z} = |z|^2$.

(b) State the De Moiver's theorem.

(C) Attempt any One. [3]

(a) Find the polar form of the complex number $1 + i$.

(b) Find the value of $(1 + i)^8 + (1 - i)^8$

(D) Attempt any One. [5]

(a) Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$

(b) If A, B, C are any three non-empty set then prove that $AU(B \cap C) = (AUB) \cap (AUC)$

2. (A) Answer the following Questions. [4]

(a) Evaluate $\begin{vmatrix} 2 & 5 & 4 \\ 1 & 4 & 3 \\ 6 & 8 & 10 \end{vmatrix}$

(b) If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 1 & 2 \\ 3 & 2 & 5 \end{pmatrix}$ then find A – B.

(c) Select the matrix which has no inverse.

(a) $\begin{pmatrix} 2 & 1 \\ 4 & -2 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & -1 \\ 4 & 2 \end{pmatrix}$ (c) $\begin{pmatrix} 2 & 1 \\ 4 & 2 \end{pmatrix}$

(d) Find the minor of the element –3 in the matrix $\begin{pmatrix} 2 & -3 & 7 \\ 4 & -9 & 1 \\ 6 & 5 & 0 \end{pmatrix}$.

(B) Attempt any One. [2]

(a) If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 1 \end{bmatrix}$ then verify that $(B + A)' = A' + B'$

(b) If the matrices $A = \begin{pmatrix} 4 & 2 & -1 \\ 3 & -7 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ -3 & 0 \\ -1 & 5 \end{pmatrix}$ then find AB.

(C) Attempt any One. [3]

(a) If $A = \begin{pmatrix} 9 & 1 \\ 4 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 15 \\ 7 & 12 \end{pmatrix}$ then find matrix X such that $5A + 3B + 2X = 0$.

(b) Evaluate $\begin{vmatrix} a & a & a \\ b & b & b \\ c & c & c \end{vmatrix}$

(D) Attempt any One. [5]

(a) Show that $\begin{vmatrix} x^3+1 & x^2 & x \\ y^3+1 & y^2 & y \\ z^3+1 & z^2 & z \end{vmatrix} = (xyz + 1)(x - y)(y - z)(x - z)$

(b) Use Cramer's rule to solve: $3x + 2y - 10 = 0$, $2x - y - 2 = 0$.

3. (A) Answer the following Questions. [4]

(a) If $f(x) = x + \frac{1}{x}$ then find $f'(2)$.

(b) Find derivative of $\tan x$ with respect to x.

(c) Find derivative of $\log(\cos x)$ with respect to x.

(d) Evaluate $\lim_{x \to 2} \frac{x^4 - 16}{x - 2}$

(B) Attempt any One. [2]

(a) Find $\frac{dy}{dx}$ if $y = e^{3x^2 - 6x + 2}$

(b) Find $\frac{dy}{dx}$ if $y = x^a + a^x + a^a$

(C) Attempt any One. [3]

(a) Find $\frac{dy}{dx}$ when $x = 2t + 3t^2$, $y = 2t - 3t^2$

(b) If $y = x^x$ then find $\frac{dy}{dx}$

(D) Attempt any One. [5]

(a) If $y = \left(x + \sqrt{x^2 - 1}\right)^m$ then prove that $\left(x^2 - 1\right)\left(\frac{dy}{dx}\right)^2 = m^2 y^2$

(b) Evaluate $\lim_{x \to 0} \frac{2^x + 3^x - 2}{x}$.

4. (A) Answer the following Questions. [4]

(a) Raw data as they are at the time of collection without any treatment are called ..... data.

(b) The point of intersection of the "less than" and "more than" ogives corresponds to which measure.

(c) One dimension diagrams are drawn on the basis of (a) or (b) or (c)?

(a) width (b) length (c) height

(d) List the important parts of Statistical Table.

(B) Attempt any One. [2]

(a) State any three limitations of Statistics.

(b) What is meant by classification? State its objectives.

(C) Attempt any One. [3]

(a) Define Classification and Tabulation. What are its uses?

(b) Draw the Histogram for the following frequency distribution.

Class :	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90	90 – 105	105 – 120
Frequency :	15	26	41	35	25	15	9	8

(D) Attempt any One. [5]

(a) Construct an Ogive curve from the following data:

Class :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency :	9	11	15	20	16	19	13	12	4	2

(b) Name various ways of presenting a frequency distribution graphically with suitable example.

5. (A) Answer the following Questions. [4]

(a) Give the formula for the empirical relationship between mean, median and mode.

(b) If $\overline{X} = 10$ and coefficient of variation = 5 then find standard deviation.

(c) Mode is also be derived graphically by using which graph.

(d) A group of 50 items has a mean 10. A subgroup of this has $n_1 = 30$, $\overline{X}_1 = 12$. Find the mean of other group.

(B) Attempt any One. [2]

(a) Standard deviation of a set of 50 items is 6.5. If every item is increase by 5 then what is revised standard deviation?

(b) Average rainfall of a city from Monday to Saturday is 3 inches.

Due to heavy rainfall on Sunday, the average rainfall for the week increased to be 4 inches. What was the rainfall on Sunday?

(C) Attempt any One. [3]

(a) Find the mean and standard deviation for the given data:

104, 107, 108, 112, 115, 100, 98, 99

(b) Calculate the median from the following data:

x	1	2	3	4	5	6	7	8	9	10
f	15	9	7	5	12	13	20	25	23	22

(D) Attempt any One. [5]

(a) Define Mean, Median and Mode with examples. Show how they can be calculated in the case of discrete value.

(b) Compute the Mean, Standard Deviation and Coefficient of Variation for the given profitability of 50 companies.

Profit % (x)	Number of companies (f)
10	15
15	10
20	15
25	6
30	4