



MBG-1603220001020200 Seat No. _____

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

March / April - 2018

Mathematics & Statistics

Time : **2.30** Hours]

[Total Marks : **70**

1 (A) Attempt All : **4×1=4**

- (1) Write the distance formula in R^2 .
- (2) Write the formula for finding an equation of line passing through (x_1, y_1) and having slope m .
- (3) Define : Unit vector.
- (4) Define : Gradient

(B) Attempt Any One : **1×2=2**

- (1) If $\phi(x, y, z) = x^2y + y^2x + z^2$ then find $grad\phi$.
- (2) If $\bar{x} = (3, -1, 4)$ and $\bar{y} = (1, -2, 3)$ then find $3\bar{x} + \bar{y}$.

(C) Attempt Any One : **1×3=3**

- (1) If $\bar{x}, \bar{y}, \bar{z} \in R^3$ and $\bar{x} + \bar{y} = \bar{x} + \bar{z}$ then show that $\bar{y} = \bar{z}$.
- (2) Find the equation of the circle with radius a in the first quadrant if it touches both axis.

(D) Attempt Any One : **1×5=5**

- (1) Find the equation of line passing through (2,1) and (4,5) and also find the slope.
- (2) If $\bar{f} = x^2 y \hat{i} - 2xy \hat{j} + 2yz \hat{k}$ then find $curl \bar{f}$.

2 (A) Attempt All : **4×1=4**

- (1) State Rolle's Theorem.
- (2) Define : Increasing function.
- (3) Define : Function of two variables.

(4) Find $\frac{\partial^2 f}{\partial y \partial x}$ for $f(x, y) = 2x^2 + 3xy + 8y^2$

(B) Attempt Any **One** : **1×2=2**

- (1) Find the Maximum value of the function
 $f(x) = x^3 - 12x + 1, x \in [-3, 5]$
- (2) Find the Minimum value of the function
 $f(x) = 3x^4 - 16x^3 + 18x^2, x \in [-1, 4]$

(C) Attempt Any **One** : **1×3=3**

- (1) Find $\frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial x \partial y}, \frac{\partial^2 f}{\partial y^2}$, if $f(x, y) = x^3 + 3x^2y^2 + y^3$
- (2) Using Maclaurin's Series expand $f(x) = e^x$

(D) Attempt Any **One** : **1×5=5**

- (1) Verify Lagrange's Theorem where
 $f(x) = e^x; x \in [0, 1]$
- (2) If $f(x) = \sqrt{x}$ expand in powers of $(x - 4)$

3 (A) Attempt All : **4×1=4**

- (1) Find $\int \sqrt{x} dx$
- (2) Find $\int \frac{1}{x} dx$
- (3) Find $\int \log_e x dx$
- (4) Find $\int \frac{1}{x^2 + a^2} dx$

(B) Attempt Any One : **1×2=2**

(1) Find $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$

(2) Find $\int (e^x + x^e + 2^x + x^2) dx$

(C) Attempt Any One : **1×3=3**

(1) Find $\int \frac{x^3 - 8}{x - 2} dx$

(2) Find $\int \frac{x^2 + 1}{x + 1} dx$

(D) Attempt Any One : **1×5=5**

(1) Find $\int \frac{dx}{x - x^3}$

(2) Find $\int \frac{5x + 2}{(x - 2)(x - 3)} dx$

4 (A) Attempt All : **4×1=4**

- (1) Define correlation analysis.
- (2) What is meant by regression analysis?
- (3) State the uses of regression analysis.
- (4) State the interval for degree of correlation.

(B) Attempt Any One : **1×2=2**

- (1) Write short note on Types of Correlation.
- (2) Find the correlation coefficient from the following data.

$$\sum x = 200, \sum x^2 = 4360, \sum y = 250, \sum y^2 = 6810, \sum xy = 5384, n = 10$$

(C) Attempt Any One : **1×3=3**

- (1) Explain the properties of correlation coefficient.
- (2) Find Spearman's rank correlation for the following data.

Fertilizers used	15	18	20	24	30	35	40	50
Productivity	85	93	95	105	120	130	150	160

(D) Attempt Any **One** : **1×5=5**

(1) Calculate Karl Pearson's coefficient of correlation.

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

(2) From the following data find out the probable yield when rainfall is 40 cms. Using regression equation :

	Rainfall (in cms.)	Production (in tons)
Mean	35	50
S.D.	5	8
Coefficient of correlation = 0.8		

5 (A) Attempt All : **4×1=4**

(1) Define mutually exclusive event.

(2) Define conditional probability.

(3) Define Exhaustive events.

(4) Define Sample Space.

(B) Attempt Any **One** : **1×2=2**

(1) Write probability density function of Normal Distribution.

(2) A card is drawn from a pack of 52 cards. What is the probability that it is either king or spade?

(C) Attempt Any **One** : **1×3=3**

(1) State multiplication theorem of probability.

(2) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $1/7$ and that of wife's selection is $1/5$. What is probability that only one of them will be selected?

(D) Attempt Any **One** : **1×5=5**

(1) Calculate the expected value of x from the following probability distribution.

$x:$	0	1	2
$P(x):$	0.3	0.4	0.3

(2) State and prove addition theorem of probability.