

2022

**B.Sc. (Honours) in AGRICULTURE**

**1st Semester Examination**

**Introductory Biology / Elementary Mathematics**

PAPER — AGS-107

Full Marks : 50

Time : 2 hours

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers  
in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

Answer from *any one* Section as directed.

**SECTION—A**

**Introductory Biology**

Answer from *all* the Groups as directed.

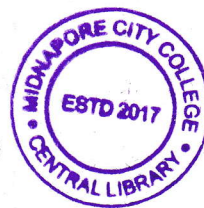
**GROUP—A**

1. Answer *any five* questions :  $2 \times 5 = 10$

(a) Define binomial nomenclature.

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(Turn Over)



( 2 )

- (b) Distinguish between monocot and dicot plants.
- (c) Define seed.
- (d) Mention the importance of root hair.
- (e) Define dominant and recessive traits.
- (f) What is tetradynamous stamen? Where does it occur?
- (g) Write down different components of thylakoid.
- (h) What is meant by crossing over?

**GROUP—B**

2. Answer any four questions :

- (a) Illustrate the different stages of meiosis-I. 5
- (b) Write a short note on epistasis. 5
- (c) What is meant by dihybrid cross? Explain it by checker board. 2+3=5
- (d) Write a short note on 'Five Kingdom Concept' proposed by Whittaker (1960). 5
- (e) Write a short note on mitochondria. 5
- (f) "Flower is a modified shoot." Justify it. 5

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( 3 )

**GROUP—C**

3. Answer any two questions :

- (a) Write down the structural differences of monocot and dicot seeds. Describe the different factors affecting the seed germination. 4+6=10
- (b) Explain back cross and test cross. Explain the multiple alleles by example. 4+6=10
- (c) Explain the different theories of origin of life. 10
- (d) Mention the four species of Brassicaceae family having agricultural importance. Discuss the floral morphology of poaceae. 4+6=10

**SECTION—B**

**Elementary Mathematics**

Answer from *all* the Groups as directed.

**GROUP—A**

1. Answer any five questions : 2×5=10
- (a) Find the equation of the straight line which passes through (0, 0) and perpendicular to the straight line  $x = y$ .

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( Turn Over )



(4)

- (a) Find the equation of the circle whose center is  $(1, 1)$  and radius is  $\sqrt{2}$  unit.
- (c) Find the equation of tangent of the circle  $x^2 + y^2 = 25$ , at the point where  $x = 3$ .

(d) Let  $A = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ . Find  $A^{-1}$ .

- (e) Let  $A(2, 1)$  and  $B(-2, 3)$  be two points. Find the point at which the line segment  $AB$  is divided into  $2 : 3$  ratio.

(f) Find  $\frac{dy}{dx}$ , where  $y = 2x^2 + 2 \sin(x^2) + \log(2x)$ .

(g) Find  $f'(x)$ , where  $f(x) = \sec x + 3 \tan^{-1}(x) + x \sin x$ .

(h) Find the center of the given circle,  $5x^2 + 5y^2 - 8x + 6y - 15 = 0$ .

### GROUP—B

$5 \times 4 = 20$

2. Answer any four questions :

(a) Represent  $A = \begin{bmatrix} 2 & -1 & 5 \\ 1 & 0 & -4 \\ 2 & 12 & 0 \end{bmatrix}$  as the sum of

symmetric and a skew-symmetric matrices.

(Continued)

(5)

- (a) Find the distance of the point  $(3, 2)$  from the straight line whose slope is 5 and is passing through the point of intersection of lines  $x + 2y = 5$  and  $x - 3y + 5 = 0$ .

- (ii) Find the angle between the x-axis and the line joining the point  $(3, -1)$  and  $(4, -2)$ .

- (c) (i) Find the equation of a line through  $(1, 3)$ , making an intercept of 5 on the y-axis.

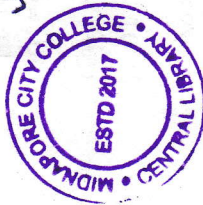
- (ii) Two lines  $2x - py + 5 = 0$  and  $ax + 3y = 2$  are parallel. Find the relation containing  $a$  and  $p$ .

- (d) The line  $4x - 3y + 12 = 0$  meets the x-axis at  $A$ . Write down the coordinates of  $A$ . Determine the equation of the line passing through  $A$  and perpendicular to  $4x - 3y + 12 = 0$ .

- (e) If  $A = \begin{pmatrix} 3 & 3 \\ -1 & 2 \end{pmatrix}$ . Find the matrix  $B$ , such that

$$A^2 + 3B = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

(Turn Over)



(6)

(i) If  $A = \begin{pmatrix} 2 & 0 \\ 3 & 1 \end{pmatrix}$  and  $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ , then find

$$A^3 - 5A^2 + 7I.$$

(ii) Find the values of  $x$ ,  $y$  and  $z$ , if

$$\begin{pmatrix} x-3 & 3x-z \\ x+y+2 & x+y+z \end{pmatrix} = \begin{pmatrix} -2 & 0 \\ 5 & 6 \end{pmatrix}.$$

GROUP—C

$$10 \times 2 = 20$$

3. Answer any two questions :

(a) (i) Find the equation of the circle which passes through  $(1, -6)$ ,  $(2, 1)$  and  $(5, 2)$  and also determine the center and radius of the circle.

(ii) Find the equation of a straight line which passes through the point of intersection of the straight lines  $y = 3x - 1$  and  $x - 2y + 3 = 0$  and parallel to  $3x - 2y + 7 = 0$ .

(b) (i) Prove that if the straight line  $\lambda x + \mu y + v = 0$  touches the parabola  $y^2 + 4px + 4pq = 0$ , then  $\lambda^2 q + \lambda v - p\mu^2 = 0$ .

(Continued)

(7)

(A) Show that  $\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$  is a solution of the matrix equation  $x^2 - 2x = 3I$ , where  $I$  is the identity matrix of order 2.

(B) If  $A$  is a square matrix such that  $A^2 = I$ , then find the simplified value of  $(A - I)^3 + (A + I)^3 - 7A$ .

(A) Solve the matrix equation :  
 $\begin{pmatrix} 2 & 1 \\ 5 & 0 \end{pmatrix} - 3X = \begin{pmatrix} -7 & 4 \\ 2 & 6 \end{pmatrix}$

(B) Given the matrices  $A = \begin{pmatrix} 2 & 1 \\ 4 & 2 \end{pmatrix}$ ,

$$B = \begin{pmatrix} 3 & 4 \\ -1 & -2 \end{pmatrix} \text{ and } C = \begin{pmatrix} -3 & 1 \\ 0 & -2 \end{pmatrix},$$

find the product  $ABC$ .

(A) State the following statement is true or false with proper justification.

$$(A+B)^2 = A^2 + 2AB + B^2$$

Where  $A$  and  $B$  are any square matrices of order 2.

(B) Define square matrix with example.

(Turn Over)



(8)

(d) (i) (A) Determine the equation of circle whose diameter is the line joining  $(1, 0)$  and  $(-1, 0)$ .

(B)  $A(5, 3)$ ,  $B(-1, 1)$  and  $C(7, -3)$  are the vertices of a triangle  $ABC$ . If  $P$  be a mid-point of  $AB$  and  $Q$  be a mid-point of  $AC$ , then show that

$$PQ = \frac{1}{2}BC.$$

(ii) (A) Find the equation of the line passing through  $(-2, 3)$  and having slope 2.

(B) Prove that,  $(-g, -f)$  is the center of the circle  $x^2 + y^2 + 2gx + 2fy + c = 0$ , where  $g, f, c$  are constants.



★★  $\left( \begin{array}{cc} (3 \times 3) - (3 \times -1) & (3 \times 3) - (3 \times -1) \\ (-1 \times 3) - (-1 \times 2) & (2 \times 3) - (2 \times 2) \end{array} \right)$

$\left( \begin{array}{cc} 7/2 & -3/2 \end{array} \right) \left( \begin{array}{cc} 9+3 & 9+3 \\ -3+2 & 6-4 \end{array} \right)$

$= \left( \begin{array}{cc} 12 & 12 \\ -1 & 2 \end{array} \right)$