



বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

**B.Sc. (Honours) in AGRICULTURE
1st Semester Examination 2021**

PAPER—AGS-107

INTRODUCTORY BIOLOGY

Full Marks : 70

Time : 3 Hours

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

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

Illustrate the answers wherever necessary.

THEORY

1. Answer any *ten* questions. 10×2
- (a) Mention the significance of meiosis in the life sexually reproducing organism.
- (b) What is MPF? Mention its function.
- (c) What is nucleotide? Mention with figure.
- (d) Define binomial nomenclature. Give an example.

- (e) Define dehiscent and indehiscent fruit.
- (f) Differentiate back cross and test cross.
- (g) What is basifixed and dorsifixed anther?
- (h) What is vivipary germination?
- (i) Why are mitochondria regarded as semi-autonomous organelles?
- (j) What do you mean by pollinia?
- (k) What are the basic difference between tap root and adventitious root system?
- (l) Define placentation. Give an example of basal placentation.
- (m) Mention the differences between simple leaf and compound leaf.
- (n) Differentiate between corymb and umbel.
- (o) What is coacervate?

2. Answer any *six* questions. 6×5

- (a) Give a short note on dominant epistasis with suitable example.
- (b) Describe the structure of chloroplast. Mention its importance. 3+2
- (c) Describe the details of prophase-I of meiosis.
- (d) Write a short note on theory of biochemical evolution of Life.
- (e) Give a short note on five kingdom concept of classification.

- (f) A tall plant with red flowers (dominant) is crossed with a dwarf plant with white flowers (recessive). Work out a dihybrid cross and state the dihybrid ratio.
- (g) Describe the structure of monocotyledonous albuminous seed.
- (h) Define dormancy of seed. Give a short note on necessary condition for seed germination. 1+4
- (i) Write the identifying characters of family Fabaceae.
- (j) What is drupe? Name its different parts. Which parts have economic importance?

PRACTICAL

Answer any *two* questions. 2×10

1. Depict the reproductive part of typical dicot plants. Describe different types of placentation.
 2. Draw, label and describe the internal structure of root and stem of monocotyledonous plant.
 3. Draw, label and describe a Pea plant.
 4. Draw, label and describe a Rice plant.
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ELEMENTARY MATHEMATICS

THEORY

1. Answer any *ten* questions.

10×2

(a) Find the equation of a straight line which is parallel to y-axis and passes through the point (-1,-3).

(b) Find the value of k for which the straight line $2x + 3y + 4 + k(6x - y + 12) = 0$ is perpendicular to the line $7x + 5y = 4$.

(c) Find the position of the centre and length of the diameter of the circle $x^2 + y^2 + 4x - 8y + 11 = 0$.

(d) Without expanding prove that
$$\begin{vmatrix} x+y & 2x+y & 3x+y \\ 2x+y & 3x+y & 4x+y \\ 5x+y & 6x+y & 7x+y \end{vmatrix} = 0.$$

(e) Find $\frac{dy}{dx}$, when $y = 2x \tan^{-1} x - \log_e (1 + x^2)$.

(f) Evaluate $\int \frac{\cos \theta}{\sqrt{1 + \sin \theta}} d\theta$.

(g) If $f(x)$ is integrable in $[0, a]$ then show that $\int_0^a f(x) dx = \int_0^a f(a-x) dx$.

(h) Find the derivative of $\tan^{-1} x$ w.r.t. $\log_e x$.

(i) If $A = \begin{pmatrix} 1 & 3 \\ -5 & 4 \end{pmatrix}$ then calculate $A^3 + A^2 - 3A$.

(j) If $P = \begin{pmatrix} 2 & 3 \\ -1 & 6 \end{pmatrix}$ then find P^{-1} .

(k) For a square matrix A , prove that $\det(\text{adj } A) = (\det A)^{n-1}$.

(l) Evaluate $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\log_e x}$.

(m) Eliminate A and B from $x = A \cos pt + B \sin pt$.

(n) Find the equation of the circle whose ends of a diameter are at $(0,0)$ and $\left(a^3, \frac{1}{a^3}\right)$.

(o) Find the distance between two straight lines $3x + 4y = 9$ and $6x + 8y + 15 = 0$.

2. Answer any *ten* questions.

10×5

(a) Express the matrix $A = \begin{pmatrix} 3 & 2 & -6 \\ 0 & -1 & 4 \\ 5 & -2 & 0 \end{pmatrix}$ as a sum of a symmetric and skew symmetric matrix.

(b) Find the solution of the following system of equation, if possible, by Cramer's rule,

$$x + 2y + 3z = 6$$

$$2x + 4y + z = 7$$

$$3x + 2y + 9z = 14$$

(c) Evaluate $\lim_{x \rightarrow 0} \left(\frac{x-1+\cos x}{x} \right)^{\frac{1}{x}}$.

(d) Show that the function $y = |x|$ is continuous at $x = 0$ but not differentiable at $x = 0$.

(e) Find $\frac{dy}{dx}$ when $y = (\tan x)^{\cot x} + (\cot x)^{\tan x}$.

(f) If $y = (x + \sqrt{1+x^2})^m$, prove that $(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2y = 0$.

(g) Integrate: $\int \frac{dx}{3 \sin x + 4 \cos x}$.

(h) Using definite integral find the sum of the following series :

$$\lim_{n \rightarrow \infty} \left(\frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{2n} \right).$$

(i) Evaluate : $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$.

- (j) Find the equation of a straight line passing through the point of intersection of two straight $2x + y = 3$ and $x - y + 5 = 0$; and perpendicular to the line $3x - 4y = 7$.
- (k) Two sides of an isosceles triangle are $7x - y + 3 = 0$ and $x + y - 3 = 0$ and third side passes through the point $(1, -10)$. Find the equation of the third side of that triangle.
- (l) Prove that the circles $x^2 + y^2 - 4x + 6y + 8 = 0$ and $x^2 + y^2 - 10x - 6y + 14 = 0$ touches to each other externally.
- (m) The line $x \cos \alpha + y \sin \alpha = p$ cuts the circle $x^2 + y^2 = a^2$ at M and N points. Find the equation of the circle whose diameter is MN.
- (n) A variable line passes through the point of intersection of two given lines $\frac{x}{a} + \frac{y}{b} = 1$, $\frac{x}{b} + \frac{y}{a} = 1$ and cuts the axes at P and Q points, respectively. Find the locus of the middle point of the line PQ.

(o) Show that
$$\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = xyz \left(1 + \frac{1}{x} + \frac{1}{y} + \frac{1}{z} \right).$$
