

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
BSc DEGREE EXAMINATION MAY 2026  
(Second Semester)

Branch -STATISTICS

MATHEMATICS - II FOR STATISTICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

| Module No. | Question No. | Question                                                                                                                                                                                | K Level | CO  |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 1            | A square matrix is a _____ if all its entries below the principal diagonal are zero.<br>(i) lower triangular matrix (ii) upper triangular matrix<br>(iii) diagonal matrix (iv) identity | K1      | CO1 |
|            | 2            | A square matrix is singular if and only if $ A $ _____.<br>(i) is equal to zero (ii) equal to one<br>(iii) not equal to zero (iv) equal to two                                          | K2      | CO1 |
| 2          | 3            | $\int \cos x dx =$ _____.<br>(i) $\sin x$ (ii) $\tan x$ (iii) $\operatorname{cosec} x$ (iv) $\cot x$                                                                                    | K1      | CO2 |
|            | 4            | $\int u dv =$ ____ - $v \int du$ .<br>(i) $uv$ (ii) $u$ (iii) $v$ (iv) $du$                                                                                                             | K2      | CO2 |
| 3          | 5            | Equation of a cardioid is _____.<br>(i) $r = a(1 + \cos t)$ (ii) $r = a$<br>(iii) $r = \operatorname{accost}$ (iv) $r = at$                                                             | K1      | CO3 |
|            | 6            | $\int_0^1 \int_0^2 xy^2 dy dx$ .<br>(i) $4/3$ (ii) $2/3$ (iii) $1$ (iv) $4$                                                                                                             | K2      | CO3 |
| 4          | 7            | $\int_0^a \int_0^a x dx dy$<br>(i) $a$ (ii) $a^3/2$ (iii) $1/a$ (iv) $-a$                                                                                                               | K1      | CO4 |
|            | 8            | Partial differentiation of $5x$ is _____.<br>(i) $5$ (ii) $6$ (iii) $4$ (iv) $3$                                                                                                        | K2      | CO4 |
| 5          | 9            | Partial differential equation of $z = (x+a)(y+b)$<br>(i) $z = pq$ (ii) $z = p$ (iii) $z = q$ (iv) $z = a$                                                                               | K1      | CO5 |
|            | 10           | On eliminating the arbitrary constant $a$ and $b$ from $z = ax + by$ we get<br>(i) $z = px + qy$ (ii) $z = pq$ (iii) $z = p$ (iv) $z = q$                                               | K2      | CO5 |

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

| Module No. | Question No. | Question                                                                                                                          | K Level | CO  |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 11.a.        | Show that the non singular matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ satisfies the equation $A^2 - 2A - 5I = 0$ . | K3      | CO1 |
|            |              | (OR)                                                                                                                              |         |     |
|            | 11.b.        | Verify Cayley Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ .                                |         |     |

Cont...

|   |       |                                                                                                  |    |     |
|---|-------|--------------------------------------------------------------------------------------------------|----|-----|
| 2 | 12.a. | Evaluate $\int_0^{\pi/2} \sin^7 x dx$ .                                                          | K4 | CO2 |
|   |       | (OR)                                                                                             |    |     |
|   | 12.b. | Evaluate $\int_0^{\pi/2} \cos^5 x dx$ .                                                          |    |     |
| 3 | 13.a. | Find the arc length of the complete arc of the cycloid $x=a(t+\sin t)$ , $y=a(1-\cos t)$ .       | K3 | CO3 |
|   |       | (OR)                                                                                             |    |     |
|   | 13.b. | Find the area bounded by the curve $x^{2/3} + y^{2/3} = a^{2/3}$ .                               |    |     |
| 4 | 14.a. | Evaluate $\int_2^3 \int_1^2 \frac{dx dy}{xy}$ .                                                  | K4 | CO4 |
|   |       | (OR)                                                                                             |    |     |
|   | 14.b. | Evaluate $\iint_D xy dx dy$ where D is the region bounded by $x=y^2, x=2-y, y=0, y=1$ .          |    |     |
| 5 | 15.a. | Determine the partial differential equation by eliminating a,b from $z = (x^2 + a^2)(y^2 + b^2)$ | K5 | CO5 |
|   |       | (OR)                                                                                             |    |     |
|   | 15.b. | Find the complete integral of $\sqrt{p} + \sqrt{q} = 1$ .                                        |    |     |

**SECTION -C (30 Marks)**

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

| Module No. | Question No. | Question                                                                                                                              | K Level | CO  |
|------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 16           | Find the sum and product of the eigen values of the matrix $A = \begin{pmatrix} 3 & -4 & 4 \\ 1 & -2 & 4 \\ 1 & -1 & 3 \end{pmatrix}$ | K3      | CO1 |
| 2          | 17           | Evaluate $I = \int_0^{\pi/2} x^2 (1-x^2)^{3/2} dx$ .                                                                                  | K4      | CO2 |
| 3          | 18           | Find the volume of the solid generated by revolving the curve $x^{2/3} + y^{2/3} = a^{2/3}$ about the y axis.                         | K3      | CO3 |
| 4          | 19           | Evaluate $\iint_D xy dx dy$ where D is the positive quadrant of the circle $x^2 + y^2 = a^2$ .                                        | K4      | CO4 |
| 5          | 20           | Find the complete integral of $(px+qy-z)^2 = 1+p^2+q^2$ .                                                                             | K5      | CO5 |

Z-Z-Z END