

**PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION MAY 2026  
(First Semester)**

**Branch – COMPUTER SCIENCE WITH DATA ANALYTICS**

**MATHEMATICAL FOUNDATION OF DATA SCIENCE**

Time: Three Hours

Maximum: 75 Marks

**SECTION-A (10 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

| Question No. | Question                                                                                                                                          | K Level | CO  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1            | The value of $\lim_{x \rightarrow 1} \frac{x-1}{x^2-1}$<br>i) 0.3 (ii) 1 (iii) 0.5 (iv) 0                                                         | K1      | CO1 |
| 2            | The value of $\lim_{x \rightarrow 0} \frac{\sin x}{x}$<br>(i) 1<br>(ii) 0<br>(iii) 2<br>(iv) 3                                                    | K2      | CO1 |
| 3            | The value of $\int_1^3 e^x dx$<br>(i) $e$ (ii) $e^3 - e$<br>(iii) $e - 1$ (iv) $e^2$                                                              | K1      | CO2 |
| 4            | The value of $\int_0^3 (x - 1) dx$<br>(i) 0 (ii) 1<br>(iii) 2 (iv) 1.5                                                                            | K2      | CO2 |
| 5            | Gauss-Jordan method reduces the matrix to<br>(i) Upper triangular form<br>(ii) Lower triangular form<br>(iii) Diagonal form<br>(iv) Identity form | K1      | CO3 |
| 6            | Which of the following is an iterative method?<br>(i) Gauss Elimination<br>(ii) Gauss seidel<br>(iii) Cramer's Rule<br>(iv) Gauss Jordan          | K2      | CO3 |
| 7            | Gregory-Newton forward formula is used when data points are<br>(i) Unequally spaced<br>(ii) Continuous<br>(iii) Random<br>(iv) Equally spaced     | K1      | CO4 |
| 8            | In the function $y = f(x)$ , the dependent variable $y$ is called<br>(i) Entry<br>(ii) Argument<br>(iii) intermediate<br>(iv) interpolation       | K2      | CO4 |
| 9            | Simpson's 1/3 rule requires the number of subintervals to be<br>(i) Odd (ii) prime<br>(iii) Even (iv) Multiple of 3                               | K1      | CO5 |
| 10           | The degree of $y(x)$ in Trapezoidal Rule is<br>(i) 1<br>(ii) 2<br>(iii) 3<br>(iv) 6                                                               | K2      | CO5 |

Cont...

**SECTION - B (35 Marks)**Answer **ALL** questions**ALL** questions carry **EQUAL** Marks

(5 × 7 = 35)

| Question No. | Question                                                                                                                                                                                                                                                                                                                | K Level | CO    |       |        |     |     |          |       |       |       |       |        |    |     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------|-------|--------|-----|-----|----------|-------|-------|-------|-------|--------|----|-----|
| 11.a.        | Find the points on the curve $y = x^4 - 6x^2 + 4$ where the tangent line is horizontal.                                                                                                                                                                                                                                 | K2      | CO1   |       |        |     |     |          |       |       |       |       |        |    |     |
| (OR)         |                                                                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 11.b.        | Differentiate $y = (2x + 1)^5(x^3 - x + 1)^4$ .                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 12.a.        | Evaluate the Riemann sum for $f(x) = x^3 - 6x$ , taking the sample points to be right endpoints and $a = 0, b = 3$ and $n = 6$ and also find $\int_0^3 (x^3 - 6x) dx$ .                                                                                                                                                 | K3      | CO2   |       |        |     |     |          |       |       |       |       |        |    |     |
| (OR)         |                                                                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 12.b.        | Find $\int \sin^5 x \cos^2 x dx$ .                                                                                                                                                                                                                                                                                      |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 13.a.        | Solve the following system by Gauss Elimination method<br>$2x + y + 4z = 12; 8x - 3y + 2z = 20; 4x + 11y - z = 33$ .                                                                                                                                                                                                    | K3      | CO3   |       |        |     |     |          |       |       |       |       |        |    |     |
| (OR)         |                                                                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 13.b.        | Solve the following equation by Gauss Jacobi method<br>$27x + 6y - z = 85; 6x + 15y + 2z = 72; x + y + 54z = 110$ .                                                                                                                                                                                                     |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 14.a.        | Using Newton's forward interpolation formula, find the pressure of the steam for a temperature of 142<br><table border="1"><tr><td>Temp.</td><td>140</td><td>150</td><td>160</td><td>170</td><td>180</td></tr><tr><td>Pressure</td><td>3.685</td><td>4.854</td><td>6.302</td><td>8.076</td><td>10.225</td></tr></table> | Temp.   | 140   | 150   | 160    | 170 | 180 | Pressure | 3.685 | 4.854 | 6.302 | 8.076 | 10.225 | K2 | CO4 |
| Temp.        | 140                                                                                                                                                                                                                                                                                                                     | 150     | 160   | 170   | 180    |     |     |          |       |       |       |       |        |    |     |
| Pressure     | 3.685                                                                                                                                                                                                                                                                                                                   | 4.854   | 6.302 | 8.076 | 10.225 |     |     |          |       |       |       |       |        |    |     |
| (OR)         |                                                                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 14.b.        | Find the missing value from the following data:<br><table border="1"><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>f(x)</td><td>2</td><td>5</td><td>7</td><td>---</td><td>32</td></tr></table>                                                                                           | x       | 1     | 2     | 3      | 4   | 5   | f(x)     | 2     | 5     | 7     | ---   | 32     |    |     |
| x            | 1                                                                                                                                                                                                                                                                                                                       | 2       | 3     | 4     | 5      |     |     |          |       |       |       |       |        |    |     |
| f(x)         | 2                                                                                                                                                                                                                                                                                                                       | 5       | 7     | ---   | 32     |     |     |          |       |       |       |       |        |    |     |
| 15.a.        | Use the Trapezoidal rule to evaluate $\int_1^2 x dx$ by dividing the interval into 5 equal parts.                                                                                                                                                                                                                       | K2      | CO5   |       |        |     |     |          |       |       |       |       |        |    |     |
| (OR)         |                                                                                                                                                                                                                                                                                                                         |         |       |       |        |     |     |          |       |       |       |       |        |    |     |
| 15.b.        | Evaluate $\int_0^1 \frac{dx}{x^2+1}$ , Using the trapezoidal rule with $h = 0.2$ .                                                                                                                                                                                                                                      |         |       |       |        |     |     |          |       |       |       |       |        |    |     |

**SECTION - C (30 Marks)**Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks

(3 × 10 = 30)

| Question No. | Question                                                                                                                                                                                                                                                                  | K Level | CO  |    |    |   |   |   |   |   |   |    |    |    |     |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|----|----|---|---|---|---|---|---|----|----|----|-----|
| 16           | Find the absolute maximum and minimum values of the function<br>$f(x) = x^3 - 3x^2 + 1, -\frac{1}{2} \leq x \leq 4,$                                                                                                                                                      | K3      | CO1 |    |    |   |   |   |   |   |   |    |    |    |     |
| 17           | Find $\int \frac{x^4-2x^2+4x+1}{x^3-x^2-x+1} dx.$                                                                                                                                                                                                                         | K3      | CO2 |    |    |   |   |   |   |   |   |    |    |    |     |
| 18           | Solve the following system by Gauss Jordan method<br>$5x - y - 2z = 142; x - 3y - z = -30; 2x - y - 3z = 5..$                                                                                                                                                             | K4      | CO3 |    |    |   |   |   |   |   |   |    |    |    |     |
| 19           | <p>In the given table, Estimate the missing value</p> <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>1</td><td>2</td><td>4</td><td>--</td><td>16</td></tr></table> <p>Explain why it differ from <math>2^3 = 8.</math></p> | x       | 0   | 1  | 2  | 3 | 4 | y | 1 | 2 | 4 | -- | 16 | K3 | CO4 |
| x            | 0                                                                                                                                                                                                                                                                         | 1       | 2   | 3  | 4  |   |   |   |   |   |   |    |    |    |     |
| y            | 1                                                                                                                                                                                                                                                                         | 2       | 4   | -- | 16 |   |   |   |   |   |   |    |    |    |     |
| 20           | Dividing the range into 10 equal parts, find the approximate value of $\sin x dx$ by i) Trapezoidal rule ii) Simpson's rule.                                                                                                                                              | K3      | CO5 |    |    |   |   |   |   |   |   |    |    |    |     |