22STU205N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Branch - **STATISTICS**

NUMERICAL METHODS

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	The order of convergence of the Newton–Raphson method is_________ a) Linear b) Quadratic c) Cubic d) Exponential	K1	CO1
	2	The main advantage of Horner's method in numerical computation is_______ a) Reduces number of multiplications and additions b) Increases degree of polynomial c) Avoids derivatives d) Provides exact roots	K2	CO1
2	3	The relation between the operators E and Δ is____ a) $\Delta = E - 1$ b) $\Delta = E + 1$ c) $\Delta = E^2 - 1$ d) $\Delta = E^{-1} - 1$	K1	CO2
	4	Which interpolation formula is best if values of x are not equally spaced? a) Newton's forward formula b) Newton's backward formula c) Newton's divided difference formula d) None of the above	K2	CO2
3	5	Everett's formula is commonly used for______ a) Odd number of data points b) Even number of data points c) Single missing values only d) Unequal intervals	K1	CO3
	6	In central difference interpolation, the step size h must be___________ a) Unequal b) Constant c) Decreasing d) Increasing	K2	CO3
4	7	The second derivative of a function can be approximated using_______ a) Forward difference only b) Central difference formula c) Simpson's rule d) Trapezoidal rule	K1	CO4
	8	The error in Trapezoidal rule is proportional to_______ a) h^2 b) h^4 c) h^3 d) h	K2	CO4
5	9	Runge-Kutta 2nd order method is also called__ a) Heun's method b) Milne's method c) Euler-Cauchy method d) Adams-Bashforth method	K1	CO5
	10	Milne's method uses previous points to______ a) Reduce truncation error b) Compute step size c) Solve algebraic equations d) Interpolate the solution	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

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

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td rowspan="3">1</td><td>11.a.</td><td>Explain the procedure of Newton Raphson Method.</td><td rowspan="3">K2</td><td rowspan="3">CO1</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>11.b.</td><td>Solve the equation x3+x−1=0 using the Iteration Method. Rearrange the equation suitably and find the root correct to 4 decimal places. Start with an initial guess x_0=0.5.</td></tr>
<tr><td rowspan="3">2</td><td>12.a.</td><td>Construct the properties of forward difference operator.</td><td rowspan="3">K3</td><td rowspan="3">CO2</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>12.b.</td><td>Solve the f (0.15) using Newton backward difference table from the data.<table><tr><td>X</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td></tr><tr><td>F(X)</td><td>0.09983</td><td>0.19867</td><td>029552</td><td>0.38942</td><td>0.47943</td></tr></table></td></tr>
<tr><td rowspan="3">3</td><td>13.a.</td><td>Using Newton's forward interpolation formula, find the polynomial f(x) satisfying the following data. Hence evaluate y at x = 1985<table><tr><td>X</td><td>1981</td><td>1901</td><td>1911</td><td>1921</td><td>1931</td></tr><tr><td>F(X)</td><td>46</td><td>66</td><td>81</td><td>93</td><td>101</td></tr></table></td><td rowspan="3">K3</td><td rowspan="3">CO3</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>13.b.</td><td>Explain the Lagrange Interpolation formula for unequal.</td></tr>
<tr><td rowspan="3">4</td><td>14.a.</td><td>Apply Newton's forward differentiation method to find solution<table><tr><td>X</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td></tr><tr><td>F(X)</td><td>1</td><td>0.9975</td><td>0.99</td><td>0.9776</td><td>0.860</td></tr></table></td><td rowspan="3">K3</td><td rowspan="3">CO4</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>14.b.</td><td>Explain the Trapeziodal rule.</td></tr>
<tr><td rowspan="3">5</td><td>15.a.</td><td>Explain the Euler's method with example.</td><td rowspan="3">K2</td><td rowspan="3">CO5</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>15.b.</td><td>Use Milne's Predictor-Corrector method with step size h=0.1 to estimate y_4 for $\frac{dy}{dx} = x + y$, following data.<table><tr><td>x</td><td>0.0</td><td>0.1</td><td>0.2</td><td>0.3</td></tr><tr><td>y</td><td>1.0</td><td>1.11</td><td>1.26</td><td>1.43</td></tr></table>Interpret y at x=0.4</td></tr>
</table>

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	Identify the root of an equation $f(x)=x^3-x-1$ using False Position method.	K3	CO1
2	17	Explain briefly the forward difference operator and its properties.	K2	CO2
3	18	Apply the Lagrange's interpolation formula and calculate the profit in the 2000 year from the following data Year: 1997, 1999, 2001, 2002 Profit in Lakhs: 43, 65, 159, 248	K3	CO3
4	19	Apply Simpson's 3/8th rule from the following data. X: 1.4, 1.6, 1.8, 2, 2.2 F(X): 4.0552, 4.953, 6.0436, 7.3891, 9.025	K3	CO4
5	20	Explain the 4th order Runge-Kutta method with step size h=0.1 to find approximate values of y at x=0.1 and x=0.2 for the differential equation $\frac{dy}{dx}=x+y$ with initial condition y(0)=1.	K2	CO5

Z-Z-Z END