Subject: Math: III/VIII M.A/M.Sc: Part- II / Composite, 1st -A/2011

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University of Sargodha

M.A/M.Sc Part-II / Composite, 1st -A/2011

Math: III/VIII **Numerical Analysis**

Maximum Marks: 40 **Fictitious #:** _____

Time Allowed: 45 Min. ***Objective Part*** **Signature of CSO:** _____

Note: **Cutting, Erasing, overwriting and use of Lead Pencil are strictly prohibited. Only first attempt will be considered.**

Q.1.A: **Choose the correct option.** **(5)**

i. The nth difference of an exact polynomial of degree n are _____:
a. Zero b. Constant c. x^m d. None of these

ii. If $f(x) = (x-1)^2 e^x$ then $x = 1$ is root of f(x) of multiplicity.
a. 1 b. 0 c. 2 d. – 2

iii. Error term $E(f) = \frac{-1}{90} h^s f^{iv}(\xi)$ is in _____ rule.
a. 3/8 Simpson's rule b. 1/3 Simpson's rule c. Trapezoidal rule d. Weedle's rule

iv. Gauss derived a Quadrature formula for integration in which Limits are:
a. -1 to 0 b. 0 to 1 c. -1 to 1 d. None of these

v. The Newton's Coset formula employ that the functional values are _____ data points.
a. Equi space b. Non equi space c. Composite space d. None of these

B: **Write true or false against each statement.** **(10)**

i. For arguments x_0, x_1, x_2 Newton's divided difference and Lagrange's interpolation formula are identical.

ii. If $f(a) > 0$ and $f(b) < 0$ then a real root lies between [a, b] of the equation $f(x) = 0$.

iii. Jacobi's method is also known as method of Simultaneous displacement.

iv. The equation $f(x) = 0$ is called an algebraic equation if it is purely a polynomial in x.

v. In Gauss backward formula we replace x_5 by $x_0 + 3h$.

vi. Solution of Homogenous difference equation consist of two parts, complementary function and particular parts.

vii. In the solution of difference equation the number of arbitrary constants is exactly equal to the order of difference equation.

viii. Product of the eigen values is always equal to the determinant of the matrix.

ix. (n + 1) points trapezoidal rule of integration is applicable if n is an odd integer.

x. The difference equation $\varphi E(y_n) = f(n)$ is called non homogeneous if $f(n) = 0$.

C: **Fill in the Blanks.** **(5)**

i. The criteria for convergence of Newton's Raphson method is _____.

ii. In power method, we choose initial vector in which largest element is _____.

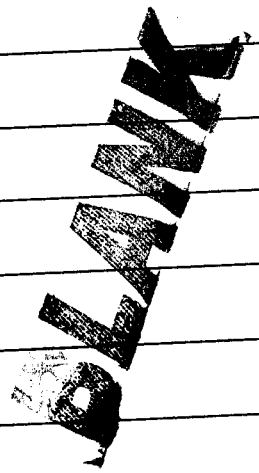
iii. The forward difference table is also called _____ difference table.

iv. Iterative methods do require _____ to initiate iteration.

v. In Gaussian formula, the limit of integration -1 to 1 can be formed by substituting _____.

Q.2. Write short answer of the following. **(20)**

i. Define Truncation error. **ii.** Write formula of first and 2nd derivative using forward difference operator. **iii.** Solve the difference equation $y_{n+2} - 5y_{n+1} + 6y_n = 0$. **iv.** Write the formula of 1/3 Simpson's rule for n = 6. **v.** Define forward difference operator. **vi.** What is predictor corrector method. **vii.** Define well conditioned matrix. **viii.** What is meant by Algorithm? **ix.** Write Newton's divided difference formula. **x.** Write the formula of Weedle's rule for n = 6.



University of Sargodha

M.A/M.Sc Part- II/Composite, 1st -A/2011

Math: III/VIII **Numerical Analysis**

Maximum Marks: 60 **Time Allowed: 2:15 Hours**

Subjective Part

Note: **Attempt any five questions, selecting two questions from section-I & II each and one question from section- III. All questions carry equal marks.**

Section- I

Q.3. Use the method of iteration to determine the real root of the equation $e^{-x} = 10x$ correct to four decimal places.

Q.4. Solve the system of equations using Crout's method

$$5x-2y+z=4, \quad 7x+y-5z=8, \quad 3x+7y+4z=10$$

Q.5. Show that Newton's Raphson method is quadratically convergent.

Section- II

Q.6. Derive Stirling's formula for interpolation. Using this formula find y(28) given that $y(20) = 49225$, $y(25) = 48316$, $y(30) = 47236$, $y(35) = 45926$, $y(40) = 44306$.

Q.7. Analyse the error of trapezoidal rule and Simpson's 1/3 rule.

Q.8. Derive the Gaussian Quadrature formula for two points.

Section- III

Q.9. Solve the following difference equation

i. $y_{n+2} - 2y_{n+1} + 2y_n = n^2$

ii. $y_{n+2} - 4y_{n+1} + 4y_n = \text{Sin } n$

Q.10. Find y(0.2) by using modified Euler's method. $\dot{y} = x + 2y \quad y(0) = 1, \; h = 0.1$