



UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig.

Roll No. in Words.

PAPER: Numerical Analysis-I

Course Code: MATH-403 Part-I (Compulsory)

MAX. TIME: 30 Min.

MAX. MARKS: 10

Signature of Supdt.:

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

1. Lagrange interpolation formula is used when the nodes are
 - (a) Equi-spaced
 - (b) Constant
 - (c) Non equi-spaced
 - (d) Both a & b

2. $1 + \Delta = E$ is equivalent to _____
 - (a) e^{2hD}
 - (b) e^{hD}
 - (c) e^{-hD}
 - (d) e^{-2hD}

3. _____ errors are caused by approximate formula in computation.
 - (a) Inherent
 - (b) Round off
 - (c) Truncation
 - (d) Natural

4. The number 0.023590×10^3 has _____ significant digits.
 - (a) 3
 - (b) 4
 - (c) 5
 - (d) 6

5. The power method for approximating dominant eigenvalue is a (an) _____ method.
 - (a) Direct
 - (b) Point-wise
 - (c) Iterative
 - (d) Continuous

P.T.O.

6. The regula falsi method has resemblance with
- (a) Bisection method
 - (b) Newton-Raphon method
 - (c) Iterative method
 - (d) None of these
7. Newton's forward difference interpolation formula is used when the nodes are
- (a) Equi-spaced
 - (b) Non equi-spaced
 - (c) Constant
 - (d) Both a & b
8. The equation $x^3 + \ln(x + 1) + e^x + \cos(x) = 0$ is:
- (a) An algebraic
 - (b) Transcendental
 - (c) Hyperbolic
 - (d) Exponential
9. The Operator $E^{-1}f(x) = f(x - h)$ is called
- (a) Shifting
 - (b) Inverse Shifting
 - (c) Central difference
 - (d) Mean Operator
10. A matrix is said to be positive definite if
- (a) It is symmetric
 - (b) $x^T Ax > 0$ for $x = 0$
 - (c) $x^T Ax > 0$ for $x \neq 0$
 - (d) Both (a) and (c)



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MAX. TIME: 2 Hrs. 30 Min.

MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q2: Answer the following short questions.

4 × 5 = 20

- (i). Define Truncation Error, Relative Error and Order of Convergence
- (ii). Suppose that \tilde{x} is an approximate solution of the system $A \underline{x} = \underline{b}$, A is a non-singular matrix and \underline{r} is the residual vector for \tilde{x} then show that for any natural norm

$$\|\underline{x} - \tilde{x}\| \leq \|\underline{r}\| \|A^{-1}\| \text{ and}$$

$$\frac{\|\underline{x} - \tilde{x}\|}{\|\underline{x}\|} \leq \|A\| \|A^{-1}\| \frac{\|\underline{r}\|}{\|\underline{b}\|} \text{ provided } \underline{x} \neq 0, \underline{b} \neq 0.$$

- (iii). For matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, compute $\|A\|_1$ and $\|A\|_2$.

- (iv). Prove that

- $1 + \mu^2 \delta^2 = \left(1 + \frac{\delta^2}{2}\right)^2$

- $\nabla + \Delta = \Delta / \nabla - \nabla / \Delta$

Long Questions

6 × 5 = 30

Q3: Find an iterative formula to find $(N)^{1/3}$, where N is a positive number and hence, find $(7)^{1/3}$ correct to four decimal places.

Q4: Find a real root of equation $x^3 - 3x - 5 = 0$ by secant method correct to three decimal places.

Q5: Derive the Gregory-Newton Backward Difference Interpolation formula.

Q6: Solve the following system of equations using Gauss Seidel method correct to two decimal places

$$5x + 2y + z = 12$$

$$x + 4y + 2z = 15$$

$$x + 2y + 5z = 20$$

Q7: The following data gives the melting point of an alloy of lead and zinc, where $t^\circ c$ is the temperature and P is the percentage of lead in the alloy. Using Gauss's forward interpolation formula, find the melting point of the alloy containing 65% of lead

P	40	50	60	70	80
$t^\circ c$	156	184	205	228	276