# 2022
## Mathematics
## [Honours]
## (B.Sc. Fourth Semester End Examination-2022)
### PAPER-MTMH C401 (Numerical Methods)

***Full Marks: 40***                                    ***Time: 02 Hrs***

*The figures in the right hand margin indicate marks*
*Candidates are required to give their answers in their own words as*
*far as practicable*
*Illustrate the answers wherever necessary*

### Group-A

**1. Answer any five questions:**                          **5x2= 10**

i)  If $y = 4x^6 - 5x$ then calculate the percentage error in $y$ at $x = 1$, when error of $x$ is 0.04.

ii) If $\int_a^b f(x)dx = \sum_0^n f(x_i)H_i^n$ , then find $\sum_0^n H_i^n$

iii) Is the operators E and $\Delta$ follows the commutative peroperty under operators multiplication rule? Justify your answer.

iv) State the advantage and disadvantage of the Newton-Raphson method.

v)  Define single step method. Give an example.

vi) Round-off the following numbers upto 4-decimal places:

   2.789654,      11.35856,      0.235082,      0.003156

vii) What is pivoting ? Why pivoting is important?

## Group-B

**2. Answer any four questions:**          $4 \times 5 = 20$

i) Describe the Euler's method for solving the differential equation $\dfrac{dy}{dx} = f(x, y)$ in a finite interval $[a, b]$ , given that $y(a) = y_0$

ii) Derive the Newton cotes quadrature formula to evaluate the definite integral $\int_a^b f(x)dx$ . Hence derive the trapezoidal rule.

iii) Explain the fixed-point iteration method for computing a real root of an equation $f(x) = 0$ and determine the condition of convergence of this method.

iv) Solve by Gauss-Jacobi iteration method:

$3x + y + z = 7,$      $2x + y + 5z = 13,$      $x + 4y + z = 9.4$

Correct upto two significant figures.

v) Determine the largest eigen value and the corresponding eigen vector of the matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

vi) What is interpolation and Extrapolation?

In a Country school going children of a certain age group is given for different years as follows:

| Year: | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|
| Number of students (In lakh): | 304 | 329 | 357 | 387 | 421 |

Estimate the number of students in the year 2025.

## Group -C

**3. Answer any one question:**          $1 \times 10 = 10$

i) Compute $y$ (0.5) by any method, from the equation $\dfrac{dy}{dx} = x^2 + \dfrac{1}{4}y^2$ , with $y(0) = -1$ and $h = 0.1$.

ii) Solve the following system of equations by matrix factorization or Gauss Jacobi method:

$3x + 2y - 4z = 12,$      $-x + 5y + 2z = 1,$      $2x - 3y + 4z = -3.$

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