

Exam Code : M-24

Subject Code—18061
Dual Degree B.Sc. (Hons.)
EXAMINATION

(Batch 2017 Onwards)
(Sixth Semester)

MATHEMATICS

BML-603

Numerical Analysis

Time : 3 Hours

Maximum Marks : 70

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks. Use of scientific calculator is allowed.

1. (a) Use the definition of various finite differences to prove that $E^{1/2} \equiv \mu + \frac{\delta}{2}$.

- (b) Find the value of x for $f(x) = 0.44$ by using inverse Lagrange method for data set :

$$x : 1.0 \quad 2.5 \quad 3.0$$

$$f(x) : 0.34 \quad 0.42 \quad 0.53$$

- (c) Use Gauss forward interpolation formula to compute the value of $f(1.5)$:

$$x : 0 \quad 1 \quad 2 \quad 3$$

$$f(x) : 1 \quad 2 \quad 1 \quad 10$$

- (d) Perform one iteration of Jacobi method to compute the eigen values of the matrix

$$\begin{bmatrix} 4 & -2 & 1 \\ -2 & 3 & - \\ 1 & 0 & 2 \end{bmatrix}.$$

- (e) Find $\frac{dy}{dx}$ at $x = 0.1$ from the following table :

$$x : 0.1 \quad 0.2 \quad 0.3 \quad 0.4$$

$$y : 0.9975 \quad 0.9900 \quad 0.9776 \quad 0.9604$$

- (f) Evaluate the integral $\int_1^2 (x^2 - \ln x) dx$ by using Gauss-Legendre 2-points formula.
- (g) Given $\frac{dx}{dt} = \frac{1-x^2}{1+x^2}$, $x(0) = 1$, compute the values of $x(0.05)$ with the aid of Euler method with $h = 0.025$.

Unit I

2. The growth of cell culture (optical density) at various pH levels are tabulated in the following table :

pH :	4	4.5	5	5.5	6
Optical density :	0.28	0.35	0.41	0.46	0.52

Compute the optical density at pH level 5.8 using Newton Backward difference formula.

3. The following data is calculated from a polynomial of degree three, but there is some

error in data, locate the error and remove it to obtain correct data set :

$x :$	-1	0	1	2	3	4
$y :$	-2	1	4	15	34	73

Unit II

4. Derive Bessel interpolation formula.
5. Reduce the following matrix to tridiagonal form using Givens methods and further obtain the

eigen values of the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 3 & 4 \\ -1 & 4 & 6 \end{bmatrix}$.

Unit III

6. A solid of revolution is formed by rotating about the x -axis, the lines $x = 0$ and $x = 1$ and curve through the points with the following coordinates :

$x :$	0	0.25	0.5	0.75	1
$y :$	0	0.247404	0.479426	0.681639	0.841471

Estimate the volume of the solid formed using composite Simpson 1/3 rule.

7. Compute the value of integral $\int_0^{\frac{\pi}{2}} \sin^2(x) dx$

with the aid of Trapezoidal formula by dividing the interval into ten equal parts and find the error bound in the value the integral.

Unit IV

8. Solve the difference equation :

$$y_{n+2} - 4y_{n+1} + 4y_n = n^2 + 3^n.$$

9. Use Milne Simpson predictor-corrector method to compute $y(0.4)$ from differential equation

$$\frac{dy}{dx} = y^2 - x^2 \text{ and the following values :}$$

$x :$	0	0.1	0.2	0.3
$y :$	1	1.11	1.25	1.42