(i) Printed Pages : 4] Roll No. .....

(ii) Questions : 8] **Sub. Code :** 0544

**Exam. Code :** 0006

# B.A./B.Sc. (General) 6th Semester Examination

# 1047

## MATHEMATICS
## (Numerical Analysis)
## Paper : III

**Time : 3 Hours]** **[Max. Marks : 30**

*Note* :– (1) Attempt *five* questions in all, selecting at least *two* questions from each Section.

(ii) Use of scientific non-programmable calculator is allowed.

### Section–A

1. (a) Using five iterations of Secand method, find a root of $f(x) = \cos x - xe^x = 0$ upto four decimal places.

(b) Show that :

$$\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$$ 3,3

2. (a) From the table given below, estimate the number of students who obtained marks between 75 and 80.

| Marks | No. of Students |
|---|---|
| 35—45 | 18 |
| 45—55 | 40 |
| 55—65 | 64 |
| 65—75 | 50 |
| 75—85 | 28 |

(b) Prove that the $n$th divided differences of a polynomial of degree $n$ are consecutive. 3,3

3. (a) Using four point Gauss Quadrature formula, evaluate $\int_{0.2}^{2.6} e^{-x}\,dx$.

(b) Evaluate :

$$\nabla^n(e^x)$$ 4,2

4. From the following table of values of $x$ and $y$, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1{\cdot}6$ using Stirling's formula :

| $x$ | $y$ |
|---|---|
| 1.0 | 2.7183 |
| 1.2 | 3.3201 |
| 1.4 | 4.0552 |
| 1.6 | 4.9530 |
| 1.8 | 6.0496 |
| 2.0 | 7.3891 |
| 2.2 | 9.0250 |

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## Section–B

5. (a) Solve the system of linear equations by Gauss-Elimination method :

$$6x_2 + 13x_3 = 61$$
$$6x_1 - 8x_3 = -38$$
$$13x_1 - 8x_2 = 79$$

(b) Compute eigen values and eigen vectors of the matrix $\begin{bmatrix} -2 & 2 \\ 2 & -2 \end{bmatrix}$ using Jacobi's method. 3,3

6. Solve the system of linear equations by Gauss-Seidel method :

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

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

$$x + 2y + 5z = 20$$ 6

7. (a) Apply Cholesky Decomposition method to solve the system of equations :

$$x + y + z = 1$$

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

$$x + 4y + 8z = 3$$

(b) Find an approximate value of $y$ when $x = 0{\cdot}1$ if $\frac{dy}{dx} = x - y^2$ and $y(0) = 1$, using Taylor's series method. 4,2

8. Apply Runge-Kutta's method of fourth order to find approximate value of $y$ at $x = 0{\cdot}2$ for $\frac{dy}{dx} = x + y^2$, $y(0) = 1$ taking $h = 0{\cdot}1$. 6