Exam. Code : 103206
Subject Code : 1223

B.A./B.Sc. Semester—VI

MATHEMATICS (Numerical Analysis)

Paper—II

Time Allowed—3 Hours] [Maximum Marks—50

Note :— Attempt any **FIVE** questions, selecting at least **TWO** questions from each section. All questions carry equal marks. Non-programmable scientific calculator is allowed.

SECTION-A

1. (a) If $u = 3v^3 - 6v$, find the percentage error in u at $v = 1$, if the error in v is 0.05.

   (b) Find the root of the equation $x\log_{10}x = 1.2$ by method of false position correct to four decimal places.

2. (a) Find the iterative formula for finding $\frac{1}{\sqrt{N}}$ for some positive real number N. Hence evaluate $\frac{1}{\sqrt{14}}$ correct to three decimal places.

   (b) Find a real root of the equation $2x = \cos x + 3$ correct to three decimal places using iteration method.

3. (a) Show that order of convergence of Newton-Raphson method is 2.

(b) Find a smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0$ correct to 3 decimal places using Muller's method.

4. (a) Apply Gauss elimination method to solve the equations $x + 4y - z = -5$, $x + y - 6z = -12$ and $3x - y - z = 4$.

(b) Using LU decomposition, solve the equation :

$2X + Y + 2Z = 2$; $X + Y + 3Z = 4$; $X + Y + Z = 0$.

5. (a) Prove that :

(i) $\Delta\nabla = \Delta - \nabla$

(ii) $\nabla = \Delta E^{-1}$

(iii) $\delta = \nabla(1-\nabla)^{\frac{-1}{2}}$

(iv) $\mu = \left[1 + \frac{\delta^2}{4}\right]^{1/2}$

(b) Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by Gauss-Jordon method.

SECTION-B

6. (a) Given y(21) = 18.4708, y(25) = 17.8144, y(29) = 17.1070, y(33) = 16.3432, y(37) = 15.5154. Find y(30) using Gauss's forward formula.

(b) Use Stirling's formula to compute y(12.2) from the following table :

X:	10	11	12	13	14
Y:	0.23967	0.28060	0.31788	0.35209	0.38368

7. (a) The values of x and y are given below :

X:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Y:	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at :

(i) x = 1.1

(ii) x = 1.6.

(b) Use Bessel's formula to find f'(0.04) given :

X :	0.01	0.02	0.03	0.04	0.05	0.06
F(x) :	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

8. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using :

(i) Trapezoidal rule

(ii) Simpson's 1/3 rule

(iii) Simpson's 3/8 rule

(iv) Weddle's rule

upto four decimals. Also compare the results with actual value.

9. Use Milne's method to find a solution of the differential equation $\frac{dy}{dx} = x + y$ at $x = 0.4$ for the initial condition $y(0) = 1$.

10. (i) Given $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ with initial conditions $y(0) = 0$ and $y'(0) = 1$. Find the solution at $x = 0.1$ using Runge-Kutta 4th order method.

(ii) Evaluate $I = \int_0^1\int_0^1 e^{x+y}\,dx\,dy$ using trapezoidal and Simpson's rules with $h = k = 0.05$.