Exam. Code: 103206
Subject Code: 1218

B.A./B.Sc. 6th Semester

MATHEMATICS (Numerical Analysis)

Paper—II

Time Allowed—Three 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

I. (a) Prove that the relative error of a product of three non-zero numbers does not exceed the sum of the relative errors of the given numbers. 5

(b) Use bisection method to solve $x^3 + x^2 + x + 7 = 0$ correct to three decimal places. 5

II. (a) Find the fourth root of 32 correct to three decimal places using the method of false position. 5

(b) Find a root of the equation $2x = \cos x + 3$ correct to three decimal places using iteration method. 5

III. (a) Solve the following system of equations by Gauss elimination method :

$3x + 4y + 5z = 40$; $2x - 3y + 4z = 13$;

$x + y + z = 9$. 5

(b) Solve the following system of equations by Gauss-Jordan method :

$10x + y + z = 12$; $x + 10y + z = 12$;

$x + y + 10z = 12$. 5

IV. (a) Solve the following system of equations by Gauss-Seidal method :—

$10x + y + 2z = 44$; $2x + 10y + z = 51$;

$x + 2y + 10z = 61$

correct to four significant digits. 5

(b) Use Muller's method to find the roots of the equation $x^3 - 3x - 5 = 0$ which lies between 2 and 3. 5

V. (a) Show that :—

(i) $\Delta \nabla y_k = \nabla \Delta y_k = \delta^2 y_k$

(ii) $e^x = \left(\frac{\Delta^2}{E}\right) e^x \frac{Ee^x}{\Delta^2 e^x}$, the interval of differencing being unity. 6

(b) Draw a backward difference table for x_i, y_i $(i = 0, 1, ..., 8)$ and hence evaluate $\nabla^5 y_5$ in terms of $y_0, y_1, y_2, ...y_5$. 4

SECTION—B

VI. (a) From the following table, estimate the number of students who obtained marks between 75 to 80.

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

5

(b) Use Stirling's formula to evaluate f(1.22), given :

x :	1.0	1.1	1.2	1.3	1.4
f(x) :	0.841	0.891	0.932	0.963	0.985

5

VII. (a) For the following data :

x :	0.5	1
f(x) :	4	1
f '(x) :	–16	–2

Find the Hermite interpolating polynomial fitting the data. 5

(b) Evluate $\int_0^2 \frac{1}{1+x^2} dx$ by using Trapezoidal rule with

(i) h = 0.2

(ii) h = 0.25.

Also find and compare the amount of error in each case. 5

VIII.(a) Find F'(x) at x = 5 from the following data :—

x :	0	2	3	4	7	9
F(x) :	4	26	58	112	466	922

5

(b) Evaluate the integral $I = \int_{-1}^{1} (1-x^2)^{\frac{3}{2}} \cos x \, dx$ by using Gauss one-point, two-point and three point quadrature rules. 5

IX. (a) Given $\frac{dy}{dx} = 1 + y^2$ with y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841, by Milne's method, compute y(0.8). 5

(b) Given the values of x and f(x) as follows :—

x :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

Evaluate f(9) using Lagrange formula. 5

X. (a) Apply Runge-Kutta fourth order method to find the solution of differential equation $\frac{dy}{dx} = x^2 + y^2$ at x = 1.2 in steps of 0.1 given that y = 1.5 when x = 1. 5

(b) Find the value of $\frac{dy}{dx}$ at x = 1.2 for the following :

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

5