Seat No. : _____

AK-116

April-2023

Integrated M.Sc. (CA & IT), Sem.-IV

Computer Oriented Numerical Methods

Time : 2:30 Hours] **[Max. Marks : 70**

Instruction : Use of non-programmable scientific calculator is allowed.

1. (a) Attempt any **one** : **10**

(1) Use Gauss Seidel method to solve the following system of linear equations :

$$10x + y + 2z = 44$$
$$2x + 10y + z = 51$$
$$x + 2y + 10z = 61$$

(2) Use Gauss Jacobi method to solve the following system of linear equations :

$$5x + 2y + z = 12$$
$$x + 2y + 5z = 20$$
$$x + 4y + 2z = 15$$

Find the approximate value of the root after fifth iteration.

(b) Attempt **all** : **4**

(1) Convert into binary : $(107)_{10}$.

(2) Find 2's complement of $(39)_{10}$.

(3) Define absolute error.

(4) Define types of errors.

2. (a) Attempt any **one** : **10**

(1) Fit a curve of the form $y = ax^b$ to the following data by the Method of least square

x	1	2	3	4	5	6	7
y	87	97	113	129	202	195	193

(2) Obtain normal equations for quadratic curve fitting using least square method.

(b) Attempt any **one** : **4**

(1) Fit a straight line to the following data :

x	1	3	5	7	9
y	2	4	15	7	8

(2) Fit a quadratic curve to the following data :

x	1	3	5	7
y	4.7	5.8	3.3	7.2

3. (a) Attempt any **one** : **10**

(1) Find $\sqrt[6]{39}$ using regula falsi method, correct upto four decimal places.

(2) Derive the formula for Newton Raphson method.

Also, find one of the root of the non-linear equation $xe^x = 1$, correct up to four decimal places using Newton Raphson method.

(b) Attempt any **one** : **4**

(1) Using bisection method, find the root of an equation $\sqrt{x} - \cos x = 0$ after fourth iteration.

(2) Find an approximate value $\sqrt{3}$ using Newton Raphson method after fourth iteration.

4. (a) Attempt any **one** : **10**

(1) From the following data interpolate the value of $x = 0$.

x	–2	–1	2	3
y	–3	2	5	10

(2) Using Newton's backward method to find the number of persons who probably will be travelling if rate is 4.2

Rate	5	4.5	4	3.5	3
Passengers	30000	40000	60000	100000	150000

(b) Attempt **all** : **4**

Prove that $\Delta \log f(x) = \log \left[1 + \frac{\Delta f(x)}{f(x)}\right]$

5. (a) Attempt any **one** : **10**

(1) Use Modified Euler method to solve the ODE y' = 1 – y with the initial condition y (0) = 0 at $x = 0.1, 0.2$ up to three decimal places.

(2) Use Runge-Kutta fourth order method to solve the ODE

$\frac{dy}{dx} = x + y$, y (0) = 1 at $x = 0$ to 0.2 by taking h = 0.1.

(b) Attempt any **one** : **4**

(1) Evaluate $\int_0^{\pi} \frac{\sin^2 x}{5 + 4\cos x} dx$ by taking n = 6 by applying Simpson's 3/8 Rule.

(2) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{1 - \frac{1}{2}\sin^2 t}$ using Trapezoidal rule with n = 6.