Seat No. : _____

AA-155

April-2019

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

Computer Oriented Numerical Methods

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

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

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

(1) Solve the following system of linear equations using Gauss-Siedel method :

$6x + y + z = 105$

$4x + 8y + 3z = 155$

$5x + 4y - 10z = 65$

(2) Solve the following system of linear equations using Gauss-Jordan method :

$x + 3y + 2z = 17$

$x + 2y + 3z = 16$

$2x - y + 4z = 13$

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

(1) Convert binary to decimal: $(1011.101)_2$.

(2) Convert binary to octal: $(11010.101011)_2$.

(3) Convert decimal to octal: $(180.6875)_{10}$.

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

(1) Explain Least square method. Also, derive normal equations for fitting of linear curves.

(2) By the method of least squares, fit a parabola to the following data:

X	1	2	3	4	5
Y	5	12	26	60	97

(b) Attempt any **one** :

(1) Fit a straight line to the following data. Also, estimate the value of y at $x = 2.5$. **4**

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

(2) Calculate the normal equations for fitting of exponential and logarithmic curves.

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

(1) Using Secant method, solve $\cos x - xe^x = 0$. Correct upto three decimal places.

(2) Using Newton - Raphson method, find the real positive root of the equation $x \sin x + \cos x = 0$, which is near $x = \pi$, correct upto four significant digits.

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

(1) Find an iterative formula for $\sqrt[n]{x}$. Also, find $\sqrt[3]{11}$ correct upto 4 decimal places.

(2) Derive the regula falsi method formula.

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

(1) Using Newton's forward interpolation formula, find the value of f (218).

X	100	150	200	250	300	350	400
f(x)	10.63	13.03	15.04	16.81	18.42	19.90	21.27

(2) Determine y(12) by using Lagrange's interpolation method from the following data :

x	11	13	14	18	20	23
y	25	47	68	82	102	124

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

(1) Using Lagrange's interpolation formula, express the given rational function as a sum of partial fractions

$$y = \frac{3x^2 + x + 1}{(x-1)(x-2)(x-3)}.$$

(2) Using Gauss's backward interpolation formula, find the population for the year 1936 given that

Year(s)	1901	1911	1921	1931	1941	1951
Population In thousands	12	15	20	27	39	52

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

(1) Using Euler's method, find the approximate value of y at x = 1.5 taking h = 0.1. Given $\frac{dy}{dx} = \frac{y - x}{\sqrt{xy}}$ and y(1) = 2.

(2) Solve $\frac{dy}{dx} = 2 + \sqrt{xy}$ with $x_0 = 1.2$, $y_0 = 1.6403$ by Euler's modified method for x = 1.6, correct upto four decimal places by taking h = 0.2.

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

(1) Evaluate $\int_0^{\pi} \frac{\sin^2 x}{5 + 4\cos x} dx$ by using Simpson's 3/8 rule.

(2) Compute the integral $\int_0^{\frac{\pi}{2}} \sqrt{\sin x}\, dx$ for n=6 with an accuracy to four decimal places Using Simpson's 1/3 rule.
