

Roll No.

Total Pages : 04

GSM/D-23
COMPUTER ORIENTED NUMERICAL
METHODS
BCA-206

1132

Time : Three Hours]

[Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What is the difference between algebraic and transcendental equations ?
- (b) State the rate of convergence of Regula-Falsi method.
- (c) State the formula for the trapezoidal rule.
- (d) What are the various types of Runge-Kutta's methods exist ?
- (e) Write down the formula for solving the integral using Simpson's 1/3rd method.
- (f) In floating point numbers, how to decide how many significant digits must be used ?

- (g) Differentiate between interpolation and extrapolation.
 (h) Comment on the purpose of studying Chebyshev's polynomial.

8×2=16

Unit I

2. (a) Explain the various types of errors that occur while performing numerical computations with the help of examples. 8
 (b) What do you mean by normalized floating point numbers? Explain the pitfalls in computing using normalized floating point numbers. 8
3. (a) Find a root of the equation

$$x^3 - x^2 - x - 3 = 0$$

using the Bisection method correct up to three decimal digits. 8

- (b) Find the order of convergence of the Newton-Raphson method. 8

Unit II

4. (a) Solve the following equations by Gauss-elimination method :

$$x_1 + 2x_2 + 3x_3 = 14$$

$$2x_1 + 5x_2 + 2x_3 = 18$$

$$3x_1 + x_2 + 5x_3 = 20.$$

(b) Write the algorithm for solving a system of linear equations using the Gauss-Siedel method. 8

5. (a) Solve $\frac{dy}{dx} = 3x + y$, where $y(0) = 0$. Find y for $x = 0.5$ by Euler's method. 8

(b) Given $\frac{dy}{dx} = 1 + y^2$, where $y = 0$, when $x = 0$, find $y(0.2)$, $y(0.4)$ and $y(0.6)$ using Runge-Kutta fourth order method. 8

Unit III

6. (a) Derive Newton's formulae for interpolation. 8

(b) Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$. 8

7. (a) Economize the series :

$$\sinh x = x + \frac{x^3}{6} + \frac{x^5}{120} + \frac{x^7}{5040}$$

on the interval $[-1, 1]$, allowing for a tolerance of 0.0005. 8

(b) Find the power series of the $\log(1 - x)$ at $x_0 = 0$ by Taylor's series. 8

Unit IV

8. (a) From the following table of values of x and y ,
obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$:

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

- (b) Compute the values of :

$$I = \int_0^1 \frac{1}{1+x^2} dx.$$

by using the trapezoidal rule with $h = 0.5, 0.25$ and 0.125 .

9. Derive the Gaussian integration formula when $n = 2$ and apply this formula to evaluate the integral $\int_{-1}^1 \frac{1}{1+x^2} dx$.