

(Library)

Con-2392 -07.

Numerical Techniques

ND-9416

(REVISED COURSE)

( 3 Hours)

[ Total Marks : 100

- N.B** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions out of remaining **six** questions.  
 (3) Make suitable assumptions if **required** and justify the **same**.  
 (4) **Write programmes in c/c++ .**

1. (a) Find absolute, relative and percentage error in following numbers. Determine number of significant digits. 5
- (i)  $a = 123.41769543$                        $\bar{a} = 123.41$   
 (ii)  $b = 0.0053102500$                        $\bar{b} = 0.0051$   
 (iii)  $c = 450550$                                $\bar{c} = 450\ 552$
- (b) What is propagation of errors ? If  $y = a \times b + c$  discuss effect on  $y$ . (a, b, c as given in Q. 1(a). 5
- (c) Define the operators  $\Delta$ ,  $\nabla$ ,  $\delta$ ,  $\mu$ , &  $E$ . Prove that 5
- (i)  $\Delta + \nabla = 2 \mu \delta$       (ii)  $E = 1 + \Delta$
- (d) Derive the equation for Regula-falsi Method using geometrical interpretation. 5

2. (a) Find a maximum of  $f(x) = \frac{-x^3}{24} + \sin x$  using golden section search. 10
- (b) Fit a straight line to the x and y values given : 10

x	1	3	5	7	8
y	6.1	9.9	14	17.9	20.05

3. (a) Evaluate the roots of the equation  $x^2 + 5x - 9.75 = 0$  lying between 1 and 2 and correct up to 4 decimal places by using bisection method. 10
- (b) Obtain solution of  $\frac{dy}{dx} = \frac{3}{\sqrt{x}} + y - 1$  using Picard's Method. 5
- Initial condition  $x = 0, y = 1$ . Find  $y$  for  $x = 0.2$ .
- (c) Write a program to solve differential equation using Eulers method. 5

4. (a) Derive Newton Cotes integration formula and use it to get trapezoidal and Simpsons rule. 10
- (b) Solve  $\int_1^4 (e^x + x^3 - 2x + 1) dx$  by using : 10
- (i) Simpson's  $\frac{3^{th}}$  rule      (ii) Trapezoidal rule.

Write a program for any one of the above method.

5. (a) Using Runge-Kutta's 4<sup>th</sup> order Method, find the numerical solution at  $x = 0.8$  for 10
- $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$ . Assume step = 0.2.  
 Develop a c/c++ program for the same.
- (b) Use Secant Method to obtain root of equation  $f(x) = x^3 - 2.5 x^2 + 3x - 1.8 = 0$  10
- accurate 3 decimal places. Initial guess  $x_1 = 1.0, x_2 = 2.0$ .

6. (a) Use Lagrange's interpolation formula to express the function  $\frac{3x^2 + x + 2}{(x-1)(x-2)(x-3)}$  as sum of partial fractions. **10**
- (b) Explain least Square Method for 1<sup>st</sup> and 2<sup>nd</sup> degree curve fitting. Write a c/c++ program for 2<sup>nd</sup> degree parabola fit. **10**

7. (a) Solve the following set of equations using Gauss-Seidal Method. **10**

$$x_1 + 10x_2 + 4x_3 = 6$$

$$2x_1 - 4x_2 + 10x_3 = -15$$

$$9x_1 + 2x_2 + 4x_3 = 20$$

- (b) Write a algorithm and c/c++ program for Gauss-Elimination Method. **10**
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