

A-2244

B. A. (Part III) EXAMINATION, 2017

MATHEMATICS

(Optional)

Paper Third (D)

(Programming in C and Numerical Analysis)

Time : Three Hours]

[Maximum Marks : 30

Note : Attempt any two parts from each question. All questions carry equal marks.

Unit—I

1. (a) What is an algorithm ? Design an algorithm to find the average of four numbers.
- (b) Write a program to calculate the compound interest of the given principal, rate of interest and number of years.
- (c) What is meant by the pointer to pointer ? What is the advantage of that ?

Unit—II

2. (a) Perform three iterations of the bisection method to compute the positive root of the equation :

$$x^3 - 5x - 4 = 0$$

- (b) Construct the quadratic interpolating polynomial to the function $f(x) = \ln x$ using the following data :

x	f(x)
2	0.69315
2.5	0.91629
3	1.09861

- (c) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by trapezoidal rule, where the interval of integration is subdivided into 6 equal parts.

Unit—III

3. (a) Solve the system of equations by using Gauss elimination method with partial pivoting :

$$0.61x_1 + 1.23x_2 + 1.72x_3 = 0.792$$

$$1.02x_1 + 2.15x_2 - 5.51x_3 = 12.0$$

$$-4.34x_1 + 11.2x_2 - 4.25x_3 = 16.3$$

- (b) Apply Jacobi's method to :

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

to compute the eigen values and eigen vectors of A.

- (c) Using QR method, find the eigen values of the

$$\text{matrix } A = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}.$$

[3]

Unit—IV

4. (a) Using Euler's method, compute the solution of :

$$\frac{dy}{dx} = y^2 - x^2$$

with $y(0) = 1$ at $x = 0, 0.1, 0.5$.

- (b) Apply Milne-Simpson method to find a solution

of $\frac{dy}{dx} = x - y^2$ in the range $0 \leq x \leq 1$ with $y(0) = 0$.

Take $h = 0.2$.

- (c) Obtain a linear polynomial approximation to the function $f(x) = x^3$ on the interval $[0, 2]$ using least square approximation with $w(x) = 1$.

Unit—V

5. (a) Generate a random variate from beta distribution :

$$f_x(x) = \frac{\alpha + \beta}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1},$$

$0 \leq x \leq 1, \alpha > 0, \beta > 0$

- (b) Explain statistical tests of pseudo-random numbers.
- (c) Explain Monte-Carlo integration for improper integrals. How do you do error analysis for Monte-Carlo integration ?