

Code : 303202

BCA 2nd Semester Exam., 2023

MATHEMATICS

(Numerical Techniques)

Time : 3 hours

Full Marks : 60

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **SEVEN** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question Nos. 1 and 2 are compulsory.

1. Answer any six of the following as directed :

2×6=12

- (a) What is required to perform chi-square test?
- (b) The Newton-Raphson method is also called as ____.
- (c) The equation $f(x)$ is given as $x^2 - 4 = 0$. Considering the initial approximation at $x = 6$, then the value of x_1 is given as ____.

(Fill in the blank)

(2)

- (d) The points where the Newton-Raphson method fails are called ____.
- (e) In the Gauss elimination method for solving a system of linear algebraic equations, triangularization leads to ____.
- (f) If $\Delta f(x) = f(x+h) - f(x)$, then for a constant k , Δk equals ____.
- (g) Following are the values of a function $y(x)$:

$$y(-1) = 5; y(0), y(1) = 8$$

dy/dx

at $x = 0$ as per Newton's central difference scheme is ____.

(Fill in the blank)

- (h) How many zeroes does a polynomial of degree n have?
- (i) Both Newton's method and the secant method are examples of fixed-point iterations.
- (j) If A is a 2×2 invertible matrix, then what is the inverse of $2A$?

(State True or False)

24AK/9

(Turn Over)

24AK/9

(Continue)

(3)

2. Answer any *three* of the following : $4 \times 3 = 12$
- (a) State Simpson's $\frac{1}{3}$ rd rule with an example.
 - (b) Construct an algorithm to implement the method of false position.
 - (c) Define order of convergence of an iterative method for finding an approximation to the location of a root of $f(x) = 0$. Find the order of convergence of Newton's method.
 - (d) Explain how to perform detection of errors using difference table.
 - (e) State Runge-Kutta method of second-order with an example.
3. Verify that the function $f(x) = \sin x$ has a zero in the interval (3, 4). Perform three iterations of bisection method and verify that each approximation satisfies the theoretical error bound. The exact location of the zero is $P = \pi$. 12
4. Starting with initial vector $X^{(0)}$, perform three iterations of Gauss-Seidel method to
- $$\begin{aligned} 2x - y &= -1 \\ -x + 4y + 2z &= 3 \\ 2y + 6z &= 5 \end{aligned}$$
- 12

24AK/9

(Turn Over)

(4)

5. Describe the difference between Euler's method and modified Euler's method with an example. 12
6. Discuss the divided differences and their properties. 12
7. Describe Newton's formulae for interpolation with an example. 12

24AK—6440/9

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