

College of Natural and Applied Sciences
Crawford University, Igbesa, Nigeria
Rain Semester Examination 2022/2023 Session CSC 414
(Computational and Numerical Analysis)

Instruction Attempt Any four (4) Questions. Time Allowed: 2 Hours

- (1) (a) With an example, describe the reason for studying Numerical Analysis
 (b) Explain the meaning of the root of an equation.
 (c) Use the Fixed Point Iteration technique to obtain one of the roots of the cubic equation, $x^3 - 2x + 3 = 0$.
 (d) Describe how the bisection method works and use the technique to obtain a root for the cubic equation in $x^3 - 2x + 3 = 0$ above.
- (2) (a) Obtain the scheme for the Newton-Raphson's Method in details
 (b) Find the root of the cubic equation $x^3 - 2x + 3 = 0$ using the Newton-Raphson's approach.
 (c) Explain the following in a way an economics major will understand it:
 (a) Error (b) Truncation Error (c) Gross Error (d) Relative Error
- (3) (a) Suppose that the result x is obtained by
 (i) Product of a and b
 (ii) Quotient of a and b
 Show that that the relative error in multiplication is equivalent to the relative error quotient.
 (b) Show that if $x = a^n$, then the relative error in x is n -multiple of the relative error in a .
- (4) (a) Explain interpolation to a Chemistry major using terms they are familiar with.
 (b) (i) Obtain the values for each of the following:
 (a) $\Delta^4 y_0$ (b) $\nabla^4 y_n$
 (ii) Establish the following:
 (a) $E\nabla = \Delta$ (b) $\delta E = \Delta$ (c) $\nabla\Delta = \Delta\nabla$.
- (5) (a) Use the table below to establish the population for the years
 (i) 1893
 (ii) 1928

TABLE 3

Years	1891	1901	1911	1921	1931
Population	52	86	98	101	128

- (b) Given the table below, establish the value at $x = 1.14$

TABLE 4

x	1	1.1	1.4	1.6	1.9
$f(x)$	0.4	9.6	6.8	10.6	11.3

- (6) (a) Establish the Simpson's Rule
 (b) Use the Simpson's and Trapezoidal rules to estimate $\int_0^1 \frac{dx}{1+x^2}$, using 0.1 intervals and compare the results.

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