



SMA 330 CAT1 241204 125015

Numerical Analysis 1 (Kenyatta University)



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KENYATTA UNIVERSITY
1ST SEMESTER 2024/2025 CAT ONE OCTOBER 2024
SMA 330: NUMERICAL ANALYSIS I

INSTRUCTIONS: Attempt ALL Questions.

- a) State any two sources of error in Numerical computation and briefly explain how they can be minimized. (3marks)
- b) Determine the percentage error in computation of $(X - Y)$ where $X = 0.3721448693$ and $Y = 0.372024371$ in a mini computer with five digit accuracy (3marks)
- c) Suppose that the sag in a beam of length L , width w and height h is given by

$S(L, w, h) = 0.0004 \frac{L^4}{wh^3}$, lengths measured in inches and the measurements have error tolerances $L = 36 \pm 1$, $w = 2 \pm 0.4$, and $h = 6 \pm 0.8$. Compute the possible range within which S lies. (4marks)

2a i) With the help of a diagram explain the difference between the root and fixed point of a function $f(x)$. (3marks)

ii) Use synthetic division to show that $f(x) = x^4 - 4x^3 + 3x^2 + 4x - 4 = 0$ has a real root(s) between -2 and 3. (2marks)

iii) Determine two fixed point formulae for the function $f(x)$ above. (2marks)

b) Starting with $x_0 = 0.12$ solve $x = 0.21 \sin(0.5 + x)$ by using iteration method and comment on the convergence of the iteration scheme. (3marks)

3 a) Using Newton Raphson method find the root of the equation $2x^3 - 5x^2 - 3 = 0$ starting with $x_0 = 2.5$. Perform two iterations. (3marks)

b) Show that the reciprocal of a number N can be obtained by using Newton-Raphson method which gives the iterative scheme $X_{n+1} = X_n(2 - aX_n)$. Hence find $\frac{1}{67}$ correct to 4 decimal places. Let $x_0 = 0.015$. (4marks)

c) Use Bisection method to approximate $\sqrt{73}$. Perform 3 iterations. (3marks)