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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2016/2017 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 16th August, 2016.
Time: 8.30am – 10.30am

KMA 107 - INTRODUCTION TO NUMERICAL ANALYSIS

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) i) Convert the hexadecimal number $(2A7.3E2)_{16}$ to Denary number system.

(3 Marks)

ii) Convert $(0111101000010010 0001)_2$ to hexadecimal number system.

(3 Marks)

b) i) Convert $(39.B8)_{16}$ to octal.

(4 Marks)

ii) Divide 0.876543E-5 by 0.200000E-3.

(3 Marks)

c) Construct a forward difference table for the following values of x and y.

x	0.1	0.3	0.5	0.7	0.9	1.1	1.3
y	0.003	0.067	0.148	0.248	0.37	0.518	0.697

(4 Marks)

d) If Δ, δ denote the forward and central difference operators, E and μ respectively the shift operator and average operators, in the analysis of data with equal spacing h, prove that;

i) $E^{1/2} = \mu + \frac{\delta}{2}$.

(3 Marks)

ii) $\mu\delta = \frac{\Delta E^{-1}}{2} + \frac{\Delta}{2}$.

(4 Marks)

e) Find the real root of the equation $xe^x - 2 = 0$ correct to 2d.p, using Newton-Raphson method.

(6 Marks)

QUESTION TWO (20 MARKS)

a) Perform five iterations of the bisection method to obtain the smallest positive root of the equation

$$f(x) = x^3 - 5x + 1 = 0$$

(8 Marks)

b) Find xy as accurate as possible given that $x = 3.55 \pm 0.005 \; and \; y = 2.73 \pm 0.005$.

(7 Marks)

c) If E is the shift operator, prove that $E = e^{hD}$ where D is the differential operator $^{d}/_{dx}$, and h is the interval size.

(5 Marks)

QUESTION THREE (20 MARKS)

a) solve the equations;

$$x + 2y + z = 8$$
$$2x + 3y + 4z = 20$$
$$4x + 3y + 2z = 16$$

by Gauss-Jordan elimination method.

(8 Marks)

b) Find the approximate value of;

$$I = \int_0^{\pi} sinxdx$$

Using; i) Trapezoidal rule

ii) Simpson's $\frac{1}{3} - rule$ by dividing the range of integration into six equal parts.

(12 Marks)

QUESTION FOUR (20 MARKS)

a) Prove the following relations

(i) $E\nabla \equiv \nabla E \equiv \Delta$

(4 Marks)

(ii) $(1 + \Delta)(1 - \nabla) \equiv 1$

(3 Marks)

(iii) $(\Delta - \nabla) \equiv \Delta\nabla$.

(3 Marks)

b) Suppose that $x = \frac{5}{7}$ and $y = \frac{1}{3}$. Use five digit chopping for calculating $x + y \; and \; x \times y$.

(10 Marks)

QUESTION FIVE (20 MARKS)

a) i) Change $(245)_{10}$ to binary.

(3 Marks)

ii) Convert $(243)_8$ to hexadecimal.

(8 Marks)

b) Given that f(*x*) is a polynomial in *x* with the following functional values; $f(2) = f(3) = 27, f(4) = 78, f(5) = 169$. Find the function $f(x)$

(9 Marks)