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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS AND COMPUTER SCIENCE)

15th April, 2024
8.30 – 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) If $x = 2.536$, find the absolute and relative errors where;

(i) x is rounded (3 marks)

(ii) x is truncated to two decimal digits. (3 marks)

b) Prove the following results:

(i) $\Delta\nabla \equiv \Delta - \nabla$ (3 marks)

(ii) $(1 + \Delta)(1 - \nabla) \equiv 1$ (3 marks)

c) Given a function $f(x)$ in x with the following functional values; f(2)=f(3)=27, f(4)=78, f(5)=169. Find the function f(x). (5 marks)

d) Convert the following numbers to the stated number system;

(i) $(421.35)_{10}$ to octal number system (2 marks)

(ii) $(B167.3C45)_{16}$ to denary number system (2 marks)

(iii) $(11110100011111110.11101111101)_2$ to hexadecimal number system (2 marks)

e)Evaluate $\int_0^1 \frac{dx}{1+x^4}$ using Trapezoidal rule and $h = 0.1$. (4 marks)

f) Convert $(3F9.DA8)_{16}$ to Octal form. (3 marks)

QUESTION TWO (20 marks)

(a) **If $\frac{1}{3}$** is approximated by 0.333, find the absolute, relative and percentage errors. (5 marks)

(b) Convert $(4A5.2B8)_{16}$ to denary number system. (5 marks)

(c) Add 0.964674E3 and 0.586351E5. (5 marks)

(d) Evaluate $f(x) = x^3 - 6.1x^2 + 3.2x + 1.5$ at $x = 4.71$, using three digit arithmetic using chopping method . (5 marks)

QUESTION THREE (20 Marks)

(a) Let p=0.54617 and q=0.54601. Use four digit arithmetic to approximate p-q and determine the absolute and relative errors using chopping method. (5 marks)

(b) Convert $(01111010000100100001001 0)_2$ to octal number system. (5 marks)

(c) Divide 0.876543E-5 by 0.200000E-2 (4 marks)

(d) Convert the following denary numbers into their octal equivalent;

(i) $(13457.321)_{10}$ (3 marks)

(ii) $(26673.4152)_{10}$ (3 marks)

QUESTION FOUR (20 Marks)

(a) Convert the following numbers to the stated number system

(i) 0.50246_{10} to duodecimal (3 marks)

(ii) 44892.6531_{10} to octal form (3 marks)

(iii) 27384.426_{10} to hexadecimal form (3 marks)

(iv) 171.356_{10} to binary form (3 marks)

(b)A missile is launched from a ground station. The acceleration during its first 80 seconds of flight is recorded as given below.

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.34	35.47	37.75	43.33	43.25	46.69	50.67

Compute the velocity of the missile using Simpson's Rule. (8 marks)

QUESTION FIVE (20 Marks)

(a) Use Gaussian elimination method to solve the following system of equations

$$\begin{aligned} 2x + \quad z &= 4 \\ -3x + 4y - 2z &= -3 \\ x + 7y - 5z &= 6 \end{aligned}$$

(8 marks)

(b) Evaluate the following;

(i) $\nabla^2(2^x)$ (4 marks)

(ii) $E^2(e^x)$ (3 marks)

(iii) $\Delta\left(\frac{5x+12}{x^2+5x+6}\right)$ (5 marks)