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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2020/2021 ACADEMIC YEAR
SECOND YEAR, FIRST SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 18th December, 2020
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) Convert the following numbers to the stated number system:
- i) $(39.D8)_{16}$ to Octal form. (3 Marks)
 - ii) $(A421.125)_{12}$ to denary form (3 Marks)
 - iii) $(9243.245)_{10}$ to binary number system (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) 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). (4 Marks)
- d) Solve the following system of linear equations using Gauss-Jordan elimination method.

$$\begin{aligned}x + 2y + z &= 8 \\2x + 3y + 4z &= 20 \\4x + 3y + 2z &= 16\end{aligned}$$

- e) Evaluate $\int_{-1}^1 \sqrt{1+x^2}$ using Trapezoidal rule where $h = 0.5$ (4 Marks)
- f) Given the following data, evaluate y at $x = 0.6$. (3 Marks)

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)

QUESTION TWO (20 MARKS)

- a) If Δ, ∇ denote the forward and backward difference operators, E in the analysis of data with equal spacing h , evaluate;
- i) $\nabla^2 ab^{cx}$ (3 Marks)
- ii) $\Delta^2(e^x)$ (3 Marks)
- iii) $\Delta\left(\frac{5x+12}{x^2+5x+6}\right)$ taking $h = 1$. (4 Marks)
- b) Suppose that $x = \frac{5}{7}$ and $y = \frac{1}{3}$. Use five digit arithmetic to approximate $p + q$ and determine the absolute and relative errors using chopping method. (4 Marks)
- c) Divide 0.978760E-5 by 0.250000E-2 (3 Marks)
- d) Add 0.964572E3 and 0.586351E5. (3 Marks)

QUESTION THREE (20 MARKS)

- a) Convert the following numbers to the stated number system
- i) 0.57926_{10} to duodecimal (3 Marks)
- ii) 98792.76531_{10} to octal form (3 Marks)
- (iii) 768384.45726_{10} to hexadecimal form (3 Marks)
- (iv) 531.3456_{10} to binary form (3 Marks)
- b) $(011110100001001000010010)_2$ to hexadecimal number system. (4 Marks)
- c) Convert $(11011110100001001000010010)_2$ to octal number system. (4 Marks)

QUESTION FOUR (20 MARKS)

- a) Convert the following numbers into their denary equivalent
- i) $(263.4152)_8$ (3 Marks)
- ii) $(F896B.3C45)_{16}$ (3 Marks)
- iii) $(1111010110011111110.1110111110111)_2$ (3 Marks)
- iv) $(896B.345)_{12}$ (3 Marks)
- b) Convert the following numbers to the stated number system;
- i) $(4DA21.3386)_{16}$ to octal number system (4 Marks)
- ii) Convert $(3745.625)_8$ to hexadecimal number system. (4 Marks)

QUESTION FIVE (20 MARKS)

- a) 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. (7 Marks)

- b) Use Gaussian elimination method to solve the following system of equations

$$5x + 2y - z = 13$$

$$3x - 4y + z = 1$$

$$x + 2y - 3z = 7$$

(7 Marks)

- c) Estimate the sales for 1966 using the following table:

Year	1931	1941	1951	1961	1971	1981
Sales	12	15	20	27	39	52

(6 Marks)