KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND SEMESTER, 2018/2019 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION AND BSC. COMPUTER SCIENCE

MATH 314: NUMERICAL ANALYSIS

STREAM: Y3S2 **TIME: 2.00-4.00 PM**

EXAMINATION SESSION: JAN-APRIL **DATE: 4/04/2019**

INSTRUCTIONS

- **Time allowed : 2 Hours**
- **This examination paper contains five questions**
- **Answer QUESTION ONE and any other TWO questions**
- **Start each question on a fresh page**
- **Indicate each question number clearly at the top of each page**
- **Do not write on the question paper**
- **Scientific calculators may be used**
- **Observe further instructions from the booklet**

QUESTION ONE (30 MARKS)

a) Use Newton-Raphson method to find the root near 2 of the equation

$x^4 - 11x + 8 = 0$ accurate to 5dp. **(5 Marks)**

b) The population of a town is as follows:

Year	1941	1951	1961	1971	1981	1991
Population	20	24	29	36	46	51

Estimate the population increase during the period between 1946 to 1976. (5marks)

(c) Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$ **(3 Marks)**

(d) Evaluate $\int_0^{1.2} \frac{dx}{1+x^2}$

using Simpsons three eighth rule taking 7 ordinates points **(5 Marks)**

(e) Compute and interpret the condition number for the function

$$f(x) = \sin x \qquad for \quad a = 0.51\pi$$ **(4Marks)**

(f) i)sin(0.1) = 0.09983 and sin(0.2) = 0.19867 , find an approximate value of sin(0.17) by Lagrange interpolation **(4marks)**

ii) Use the secant method to determine the roots of the equation

$f(x) = x^3 - 4x + 1$ **(4marks)**

QUESTION TWO (20 MARKS)

(a) Evaluate the integral

$$\int_0^{1.2} e^x$$

using Weddle's rule taking n = 6 correct to 5d.p. **(7 Marks)**

(b) Apply Lagrange's interpolation formula to find a polynomial which passes through the points (0,-20), (1,-12), (3,-20) and (4,24) **(6 Marks)**

(c) Use Newton's Forward interpolation formula to find the value of $\cos 52^o$ from the following set of data

x	**45^0**	**50^0**	**55^0**	**60^0**
y=f(x)	**0.7071**	**0.6248**	**0.5736**	**0.5000**

(7 Marks)

QUESTION THREE (20 MARKS)

a) For the function $f(x)$

x	4	5	6	7	8	9	10
$f(x)$	-10	12	56	128	264	380	572

Find $f(4.5)$ using Grecory Newton difference. (10marks)

b) Find the value of $\int_0^{0.6} e^x + 1 \, dx$ taking n=6 correct to five significant figures using

i) Trapezoidal rule (3marks)

ii) Simpson's $\frac{1}{3}$ rule (3marks)

iii) Simpson's $\frac{3}{8}$ rule (4 marks)

QUESTION FOUR (20 MARKS)

a) A slider in a machine moves along a fixed straight rod. Its distance x(m) along the rod are given in the following table for various values of time t(seconds)

t(s)	1	2	3	4	5	6
x(m)	0.0201	0.0844	0.3444	1.0100	2.3660	4.7719

Find the velocity and acceleration of the slider at time t = 6s **(10 Marks)**

b)

x	0	1	2	3	4
Y=f(x)	1	4	17		97

Determine the missing value **(5 Marks)**

c) Evaluate $\sqrt{29}$ to 5dp using Newton –Raphson Method **(5 Marks)**

QUESTION FIVE (20 MARKS)

(a) Find a polynomial of degree three or less to approximate f(x) =sin x near $x_0 = 0$ and use the polynomial to obtain the approximate value of sin(0.1). (7marks)

(b) b) Find a unique polynomial of degree 2 or less such that f(0) =1 ,f(1)=3 and f(3) =55 using (i) Lagrange interpolation formul

(c) (ii) Newton divided difference interpolation formula (8marks)

(d) Find an iterative formula to find $\sqrt{N}$ where N is a positive integer hence find $\sqrt{7}$ (5marks)