KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE AND BACHELOR OF ECONOMICS & MATHEMATICS

COURSE CODE: MATH 314

COURSE TITLE: NUMERICAL ANALYSIS EXAM

STREAM: Y3S1

DAY: MONDAY

TIME: 11.00 – 1.00 P.M.

DATE: 08/12/2008

INSTRUCTIONS TO CANDIDATES:

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

PLEASE TURN OVER

QUESTION ONE(30 MARKS)

(a). In a triangle ABC, a = 5 cm, c = 15 cm, $<B = 90^0$. Find the possible error in the computed value of A if the errors in a and b are $\frac{1}{2}$ % and $\frac{1}{3}$% respectively. (6 marks)

(b). Locate the error in the following entries and correct it: 125 132.651 140. 608 148. 877 157. 464 166.357 175.616 185. 193 195.112 205.379 216. (5 marks)

(c). Use the Advancing difference formula to find f(50):

x:	15	20	25	30	35
f(x):	1558	1806	2094	2427	2814

(5 marks)

(e). Evaluate: $(\Delta+\nabla)^2(x^2+x+1)$, h = 1. (5 marks)

(f). Use Newton – Raphson method to find $\sqrt{3}$ to six decimal places with $x_0 = 2.$ (5 marks)

(g).Estimate the missing term in the following:

x:	1	2	3	4	5	6	7
y:	2	4	8	_	32	64	128

(4 marks)

QUESTION 2 (20 MARKS)

(a). Use the iterative mehod to find the real root of the equation 3x - $\log_{10} x$ =6 if the root lies in the interval (2, 3). (5 marks)

(b). Solve the equation $x^4 - x - 9 = 0$ by Newton Raphson Method. (5 marks)

(c). Show that the iterative formula for finding the reciprocal of n is

$x_{i+1} = x_i(2 - nx_i)$ and hence find the value of $\frac{1}{31}$. (5 marks)

(d). Solve the following equation by Regula Falsi method: $x^3 + x - 1 = 0$.

(5 marks)

QUESTION 3 (20 MARKS)

a. Use Bessel's formula to find f(0.36) from the following table:

x:	0.1	0.2	0.3	0.4	0.5	0.6
y:	1.172	1.008	0.878	0.782	0.720	0.692

$$[\quad y = \frac{y_0 + y_1}{2} + v\Delta y_0 + \left(\frac{v^2 - \frac{1}{4}}{2}\right)\frac{\Delta^2 y_{-1} + \Delta^2 y_0}{2} + ----------------]$$

(5 marks)

b. Using the table below, evaluate $f^{11}(4)$ using Stirling's formula:

$$y = y_0 + u\frac{\Delta y_{-1} + \Delta y_0}{2} + \frac{u^2}{2}\Delta^2 y_{-1} + \frac{u(u^2 - 1)}{3!}\frac{\Delta^3 y_{-2} + \Delta^3 y_{-1}}{2} + \frac{u^2(u^2 - 1)}{4!}\Delta^4 y_{-2} + --------$$

x:	2.4	2.8	3.2	3.6	4.0	4.4	4.8
f(x):	0.18322	0.34164	0.48324	0.61245	0.73205	0.84391	0.94936

(5 marks)

(c). Given the following tabulated function:

x:	1.0	2.0	3.0	4.0
f(x)	150	36.75	17.33	9.19

Find f(5.0). (5 marks)

(d). Use the Trapezoidal rule to find $\int_{1}^{2} \frac{1}{1+x} dx$, h = 0.1. Compare with exact solution. (5 marks)

QUESTION 4 (20 MARKS)

(a). Calculate a fourth divided difference for the following values:

x:	0	1	2	4	5
y:	0	16	48	88	0

(4 marks)

(b). Use Lagrange's interpolation formula to find f(4.3) for the following:

x:	0	1.0	2.0	3.8
f(x):	0	0.569	0. 791	0.224

(5 marks)

(c). Find the polynomial of degree three which takes the values prescribed below using Lagrange's method

x	0	1	2	4
y	1	1	2	5

(6 marks)

(d). Evaluate: $(2\Delta+3)(E+2)(3x^2+2)$ where h =1 (5 marks)

QUESTION 5 (20 MARKS)

(a). Prepare a forward difference table for the following function:

x	1	2	3	4	5
f(x)	6	10	46	138	430

assuming the function is a polynomial, interpolate for f(4.31) using forward difference interpolation with x=4 as starting point.

(5 marks)

(b). Given the following function values:

x	0	0.5	1.0	1.5	2.0	2.5
f(x)	2.014	3.221	4.701	7.710	13.594	23.580

Find f(3.0). (5 marks)

(c). Prove:

(*i*) $E^{\frac{1}{2}} = \mu + \frac{1}{2}\delta$ and $E^{-\frac{1}{2}} = \mu - \frac{1}{2}\delta$

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

(iii) $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{1}{4}\delta^2}$

(10 marks)